AN INTEGRATED VERTICAL URBAN SCHOOL FOR THE 21ST CENTURY HONG KONG

by
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A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Master of Architecture

Waterloo, Ontario, Canada 2018

Author Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Urban population continues to rise at an unprecedented rate. High-rise commercial and residential developments continue to intensify the cityscape. While intensification increases the quality of life for most urban citizens. The same cannot be said for families with children living in the urban core. There are typically insufficient spaces in current urban schools to support this demographic shift. Imbalanced student enrollment across the city's sub-divisions are becoming a more prominent urban problem. The growing urban population has begun to out-pace the provision of child-supportive infrastructure. Children living in the intensified areas attend over-crowded schools, compromising the quality of learning and the distribution of resources.

The research focuses on current urban development, school types and the situation of urban schools in developed cities, with a focus on the situations in Hong Kong S.A.R., China.

The relationship between teaching pedagogy and school building forms a foundation for the architectural type proposed by this thesis. The proposed school opens up a dialogue to discuss the roles of schools in the city with regards to the current urban conditions. It becomes an institution that reaches into the community and functions as an urban apparatus that connects the gaps between schools and the urban families' lifestyle. The design manifests a flexible and adaptable learning environment at different scales. The design focuses on increasing the utilization of school facilities in the urban communities, at the same time, providing innovative group and individual learning spaces that are suitable for the pedagogical trends in the 21st century.

Acknowledgements

To my supervisor Terri Boake, committee member Donald McKay, TDR professor Val Rynnimeri, internal reader Adrian Blackwell, external examiners Adam Kanza and Yvonne Yeung. Thank you for your time, insights, encouragements, criticism and understanding throughout this journey.

To all the principals and supervisors at the schools in Hong Kong, Ms Ivy Ip (葉淑婷校長), Ms Chiu (趙劍眉校長), Ms Au (區詠恩校長), Ms Cheung (張作芳校長) and Rev. Jeremy Lau (劉其盛牧師). Thank you for taking the time to walk me through your schools and to respond to my requests for information. Thank you for your inspirational stories, trust and generosity.

To my family. Thank you for supporting me through this journey. You are my biggest motivation. Your endless love and patience made this possible.

To my companions. Sheida Shahi, Anam Kham, Rakshya Gauchan, Dina Tranze-Drabinia, Xiaowen Xu and Paniz Moayeri thank you all for helping me through with your experience and listening ears.

Thank you.

Dedication

Dedicated to Hayley and Terence.

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Figure 1 Harbour Road Garden, Wai Chai, Hong Kong.

Preface

A True Story...

There was a 4-year old girl, named Hayley. She lived in a suburban neighbourhood in Southern Ontario, near Toronto.

One day, she and her family took the train to downtown Toronto for a long weekend family day trip. It was her first time on a train, as far as her memory goes. The moment she stepped outside of the train, she began looking upwards, as if she was trying to search for the sky. They walked through the underground path and the streets above. She could not quite figure out when was the best time to step onto the escalator. Also, the room that moves up and down with buttons on the wall was fun.

That night when she got home, she told her mother that she likes that place with tall buildings.

I told her, "mommy grew up in a place with even taller buildings, they were so tall that you could only see little bits of the sky, shaped like letters and numbers. I lived in a tall building and my school was a tall building too."

She said, "A really tall building?"

"Yes dear, I walked up and down many staircases to get to my classrooms everyday."

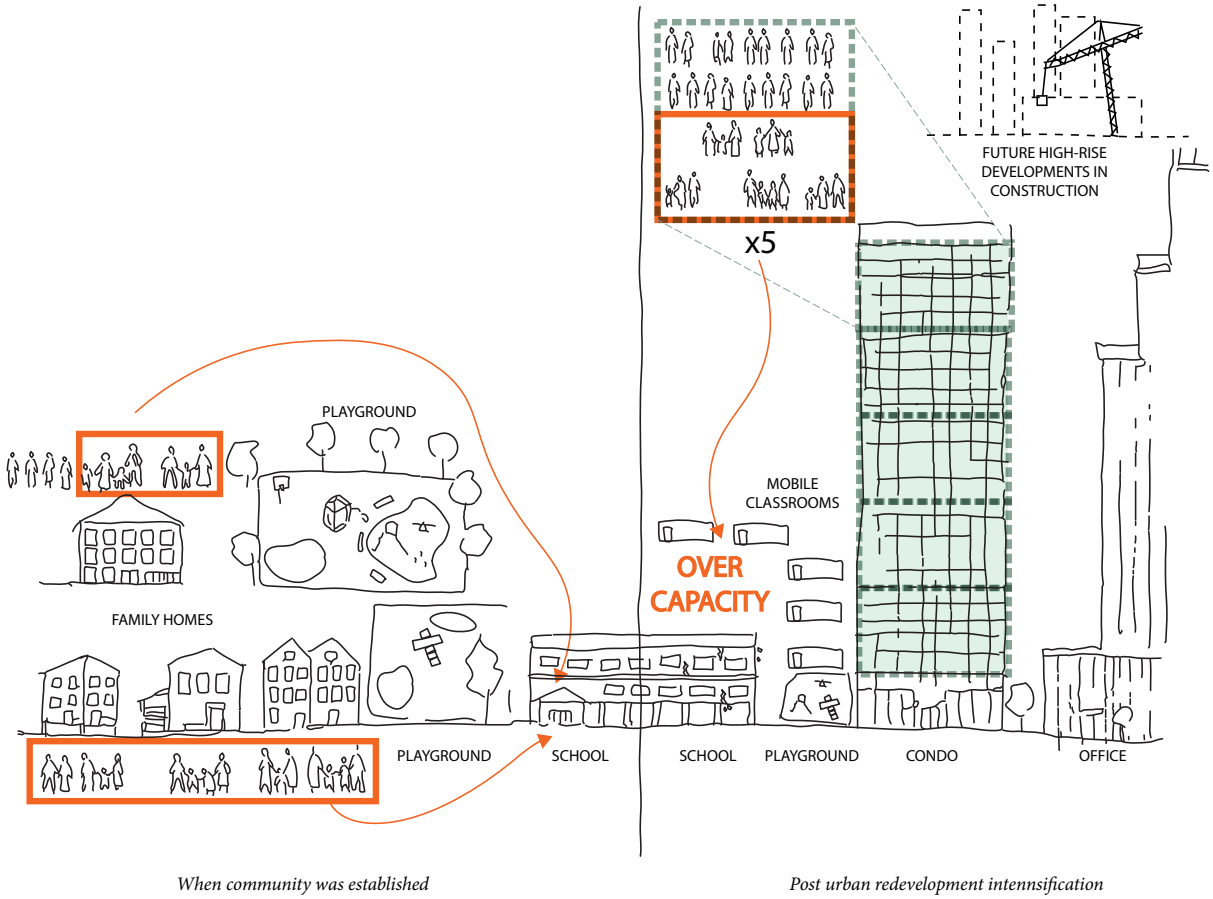


Figure 2 Graphic illustration of the insufficient school spaces found in densified urban cores.

Introduction

Problem Statement

Urbanization and the need for Schools at the Cores of Cities

Urbanization trends worldwide are attracting more and more people to live in cities. The United Nations Department of Economic and Social Affairs predicts that urban cities expect to gain 1.1 billion urban dwellers between 2015 and 2030. [1] The shifting population distribution between urban cities and rural areas will affect urban development in the years to come. Basic services like healthcare, education and housing will be in higher demands. Especially in developing cities where urbanization rates are higher than in developed cities. Today, urban densification and rapid urbanization upsurge are two of the main causes of overcrowding school enrollment problems in both developed cities and developing cities. [2] For example, from 2007 through 2013, 43.5% of public school students went to schools in overcrowded school buildings in the city of New York.[3] According to the United Nations population predictions, three-quarters of surveyed developing countries will anticipate a 20%-40% growth in school enrollment between 2015 and 2030.[4]

The Uneven School Development in Hong Kong

The current situations in over-crowding schools compromise education quality, and the convenience of the urban lifestyle as school resources are spread thin. In Hong Kong, an uneven school development arises in this past decade due to consequences of the rapid intensive urbanization that happened in the mid-to-late twentieth century. In 1945 the population of Hong Kong was 600 thousand and grew rapidly to 3 million by 1949[5].

In 2017, the population of Hong Kong approached 8 million, and the Council on Tall Buildings and Urban Habitat rank Hong Kong the no.1 city in the world by the number of 150m+ completed buildings[6]. The high-density development phenomenon that began shortly after the end of WWII transformed the fallen

1 United Nations, Department of Economic and Social Affairs, Population Division (2015). Population 2030: (ST/ESA/SER.A/389). 37.
2 Ibid. 38.

3 New York City Independent Budget Office. "New York City Public School Indicators: Demographics, Resources, Outcomes". July 2014.38. http://www.ibo.nyc.ny.us/iboreports/2014edindicatorsreport.pdf

4 Surveyed by the United Nations, results from the reports shows that the majority of these are cities in Africa and Asia. United Nations, Department of Economic and Social Affairs, Population Division (2015). Population 2030: (ST/ESA/SER.A/389). 16.
5 薛求理(Xue, Charlie Q.L..) "城境： 香港建筑 (Cheung jing: Xianggang jian zhu), 1946-2011 = Contextualizing modernity : Hong Kong architecture 1946-2011".商務印書館(香港)有限公司 (Shang wu yin shu guan(Xianggang) you xian gonf si). Hong Kong. August, 2014. 29.

6 CTBUH. "The Skyscraper Center – Hong Kong Facts". Council on Tall Buildings and Urban Habitat. 2017. http://www.skyscrapercenter.com/city/hong-kong. Accessed Nov 23, 2017.

colonial village to one of the world's densest compact cities within 60 years.[7] To facilitate urbanization and the explosion of population growth the construction of public housing and public services became an urban planning focus. Between 1950 and 1997, excluding the 8500 63-120 square foot short-term resettlement units, over 700 thousand public housing units were constructed and 39% of the population lives in public housing developments.[8] School buildings were part of the intensive public housing and public services densification process. In every public housing estate development, institutional lot and school buildings were built and allocated within proximity to serve the community. Unfortunately, due to high salt content – from seawater - in the concrete mixture, the schools and housing projects built during this period have become structurally unsafe now. The structural phenomenon is caused by chemical reactions and the built up of salt that severely increases the risk of corrosion of the reinforcing steel within the concrete.[9]

In 2016 Kin-Yuen Ip, the Legislative Councilor of the Education Constituency of Hong Kong published a document stating that 58% of school buildings in Hong Kong were constructed over thirty-one years ago, out of which seven schools that were constructed over forty years ago do not have fire and safety protection systems installed for the building.[10] Furthermore, current school buildings basic building standards require all primary schools to be at least 3950m^2 in size and, secondary schools to be 6950m^2, also with a provision of a standardized outdoor recreational ground. At this time, one hundred sub-standard schools constructed over 30 years ago are below 3000m^2, some with no private playground. Concrete wall cracks and fallen concrete crumbles are not uncommon to find in these school buildings too.

Comparing to the rate at which intensification is happening within the district urban cores of Hong Kong, school's redevelopment process in the cities are occurring at a much slower rate. 90% of schools in Hong Kong are dissatisfied with the current physical state of the school premises and the lack of renovation and maintenance resources provided by the government.[11] Furthermore, the concentration of the children in the neighbourhoods where the most desired institutions are located also intensifies imbalanced student enrollment condition across the city today. The provisioning of school spots in the desired core areas does not proliferate to the rate the children population is growing, but schools in areas further away from the intensified core are in some cases underutilized.

7 Ibid. 284.
8 Ibid. 42-60.
9 Wegian, Falah M. The IES Journal Part A: Civil & Structural Engineering. Vol. 3, No. 4, November 2010, 235–243.
10 Ip, Kin Yuen. Office of Ip Kin Yuen Legislative Councillor (Education Constituency). "改善校舍.刻不容緩 – 特刊 II" . September, 2016. 5.
11 Ibid. 5.

The Vulnerability of School Lots in the City

The Hong Kong urban planning guidelines and the zoning-by-laws permit and reserve the right to allocate sites for primary and secondary schools on high-density residential zoned land[12]. The amount of lot coverage for schools is determined by the officials based on individual subdivision demands. However, valuable real estates in city centres make reserving land for low-density schools economically undesirable, with the support of an overall decrease in children's demographic, school lots in the city centre could potentially be replaced by profitable high-density developments. A recent example, the Lingnan Primary School and Kindergarten, was a 50-year-old school campus, located in the prime real estate district in Wai Chia, Hong Kong. The school was required to relocate in 2013. Despite that the building passed building safety inspections conducted by the officials at the Building Department, the education organization claimed that the building is not suitable and safe for teaching. Partial of the Lingnan school (including the land and existing buildings of the associated Lingnan secondary school which had been relocated in 2000) property were sold for private real estate development in 2011.[13] Demolition of the school's campus began in 2013 for the new construction of a high-end real estate housing complex and the redevelopment of a new school campus.[14] Institutional sites in urban cores are physically constrained by the lack of developable land in the surrounding area and economically pressured by high real estate values. A specific type of school - the "Matchbox School" in Hong Kong is further investigated in the thesis. This type of school was built approximately 40-60 years ago to accomodate immigrants fleeing from mainland China. The population of Hong Kong increased drastically within a decade. The "matchbox school" was a 6 story cuboid formed building that was reproduced in multiple low-income residential distrits to accomodate the increasing education demands. As of today, 28 matchbox schools are still serving as public primary schools, and only 2 of them were permitted to relocate as the buildings have become too dangerous for the occupants or due to other urban redevelopment plans. These schools were built within or nearby a standard Hong Kong government built housing estate (typically, in lower income neighborhoods within the old district centers). Since new buildings have taken over the surrounding lands, they are bound within a very small piece of land with very little or no room to expand.

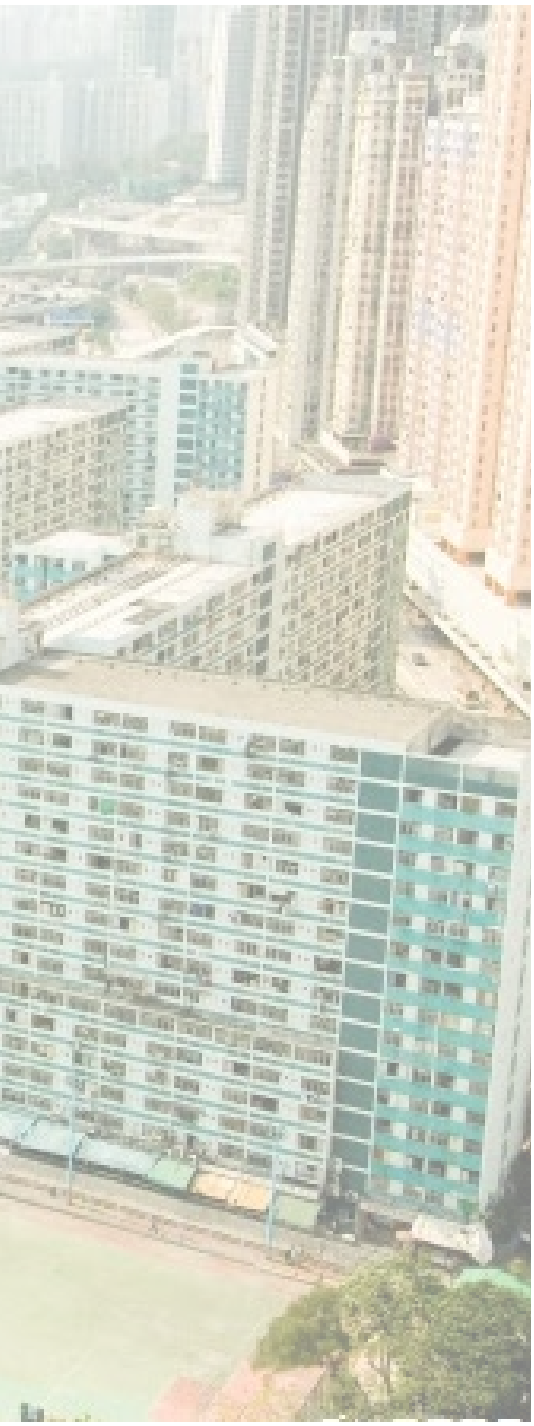
New construction and redevelopment of existing schools on urban lots are becoming an increasingly relevant urban development topic. The situation in Toronto, Canada, Melbourne, Australia and New York City, the United States has been further studied in Part 1 of this thesis as a comparison to the situation in Hong Kong S.A.R., China.

12 Planning Department, The Government of Hong Kong S.A.R. "Hong Kong Planning Standard and Guideline - Table 7 : Assumptions on Roadspace, Open Space and School Facility Provision" July, 2016. Accessed Nov 25, 2017.

13 http://www.info.gov.hk/gia/general/201112/14/P201112140166.htm

14 Lingnan Education Organization Limited. News. July 1, 2012. http://www.lingnan.org.hk/files/LEO_press_release_final_c_120107.pdf. Accessed April 3, 2018.

Figure 3 A six-storey "matchbox school" (at the foreground) at one of Hong Kong's public housing estate.



Pedagogical Progression and The Development of Schools

Schools are the physical apparatus for the education systems. Sir Ken Robinson, Ph.D., [15] a leading education researcher describes that the education system is "complex and adapting," similar to the organic living systems such as plants, animals and people.[16] Education can adapt and evolve according to the dynamics of the culture, the organization, the technology and the physical environment. "There is great diversity within and between education systems. Although many national systems have similar industrial characteristics, there are different levels of prescription and control"[17]. The education system evolves constantly and continuously, but school buildings last for decades. Standardized schools built in the mid-late 20th century were built to suit the industrialized society. These types of school buildings were more focused on cellular learning and were designed for more structured school activities. Less organic and physically adaptive compared to the more recent schools. Numerous newer 21st-century schools built worldwide show that school architecture is a close reflection of the most current pedagogy. However, outdated school buildings remain as a questionable subject.

In The Third Teacher, Bruce Mau and a team of international architects and designers explained 79 practical design strategies that can transform and improve the ability for children to learning and to strengthen the relationship between the school and its community[18]. Combining the Mau's theoretical approaches and a selection of precedents, a design guideline – Part 4 - was developed to form the basis of the final proposal.

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15 Sir Ken Robinson is a leading researcher, writer and speaker in education. He was a professor of arts education at the University of Warwick and now a professor emeritus. Sir Ken Robinson works with governments, education systems, international agencies, global corporations and some of the world's leading cultural organizations to unlock the creative energy of people and organizations. His 2006 talk, "Do Schools Kill Creativity" has been viewed online over 40 million times and seen by an estimated 350 million people in 160 countries.

16 Ibid. 62.

17 Ibid. 63.

18 Mau, Bruce, Cannon Design and VS Furniture. "The Third Teacher: 79 Way You Can Use Design to Transform Teaching & Learning." Abrams, New York, New York. 2010.

Figure 4 Integrated Vertical School Aerial.

The Proposal

Figure 5 Selected site - 1970s.

Figure 6 Selected site - current state.

To address inconvenience caused by over-crowding schools in the urban cores and the vulnerability of school buildings in the city from an urban planning perspective, the thesis proposes a new typological approach for the redevelopment of existing urban school sites. The proposed development can be the solution to regenerate outdated school facilities in cities. First, it addresses an urban planning and land-use limitation problem by incorporating the school typology into a mixed-use residential and community complex in a phased sequence to minimize disruption to the function of the existing school. Moreover, minor adjustments to the program mix of the building and construction time line can be adjusted in response to the demographical needs of the community. Third, the mixed-use programmatic organization increases the proximity of student life and the family and personal life which promotes a family-friendly community suitable for a variety of age groups living together. Finally, with this development model, the cost of demolition and construction of schools can be covered financially by housing developments on the same site – this financial model is further investigated in Part 4 - Design Guidelines.

The thesis places its main focus on the design of the school block within the mixed-use complex. It engages critical learning environment qualities derived from the research and analysis of innovative and sustainable school environments. Modular construction methods are applied to the design strategies hence it could be re-built in multiple sites of similar nature in the city with minimal modifications.

The result of this proposal is architecturally specific to the site selected, and typologically appropriate for most, if not all of the similar schools within the context and historical backgrounds of Hong Kong – a post-colonial, high density and financially driven city.

An Integrated Vertical School

The intergrated vertical school is an examplary solution for urban school redevelopment projects in high density urban areas that could replace the current "matchbox schools. The building is a combination of three main building blocks 1) the school; 2) the community podium and 3) the residential towers. The building blocks are integrated together to form a mixed-use "podium tower" where facilities and resources can be shared. The design places main focus on the school block with an intention to create a family-oriented community that is based on schools.

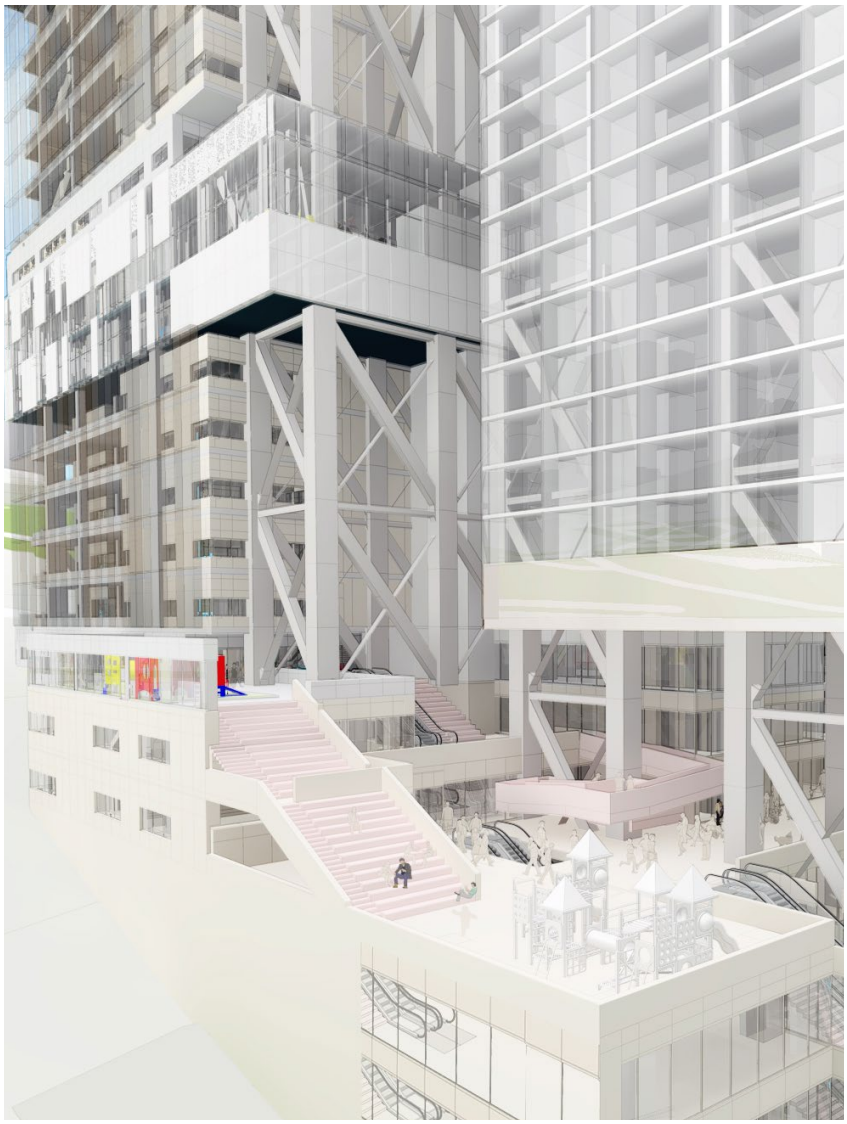
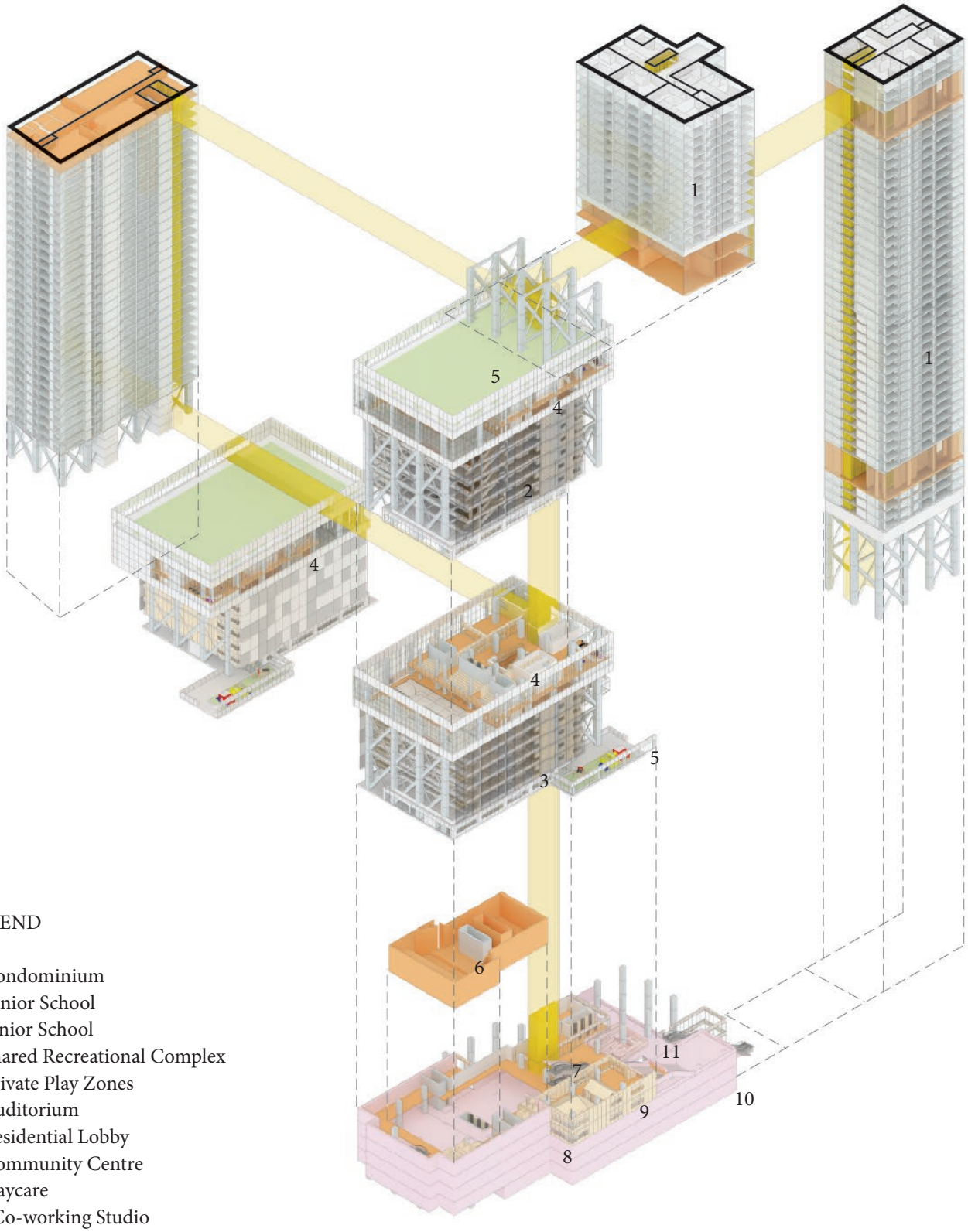


Figure 7 At the podium of the development - The Community Podium



LEGEND

1. Condominium
2. Senior School
3. Junior School
4. Shared Recreational Complex
5. Private Play Zones
6. Auditorium
7. Residential Lobby
8. Community Centre
9. Daycare
10. Co-working Studio
11. Outdoor Public Play/ Fitness Zone

Figure 8 Exploded axonometric overall diagram.

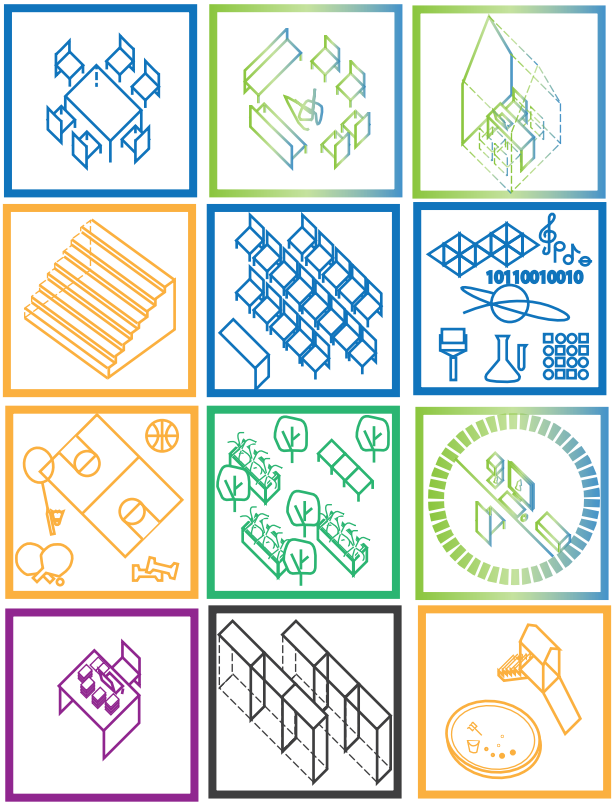


Figure 9 Graphic illustrations of a variety of learning environments.

Thesis Structure

The thesis is structured into five parts.

Part 1 describes the problem and outlines the underlying reason for the negligence of school planning in developed urban cities with a focus on the situation of schools in Hong Kong.

Part 2 Provides context information and the socio-political framework regarding the relationship between the family-friendly urban lifestyle and the contemporary urban city.

Part 3 is a brief discussion on the changes concerning the school typology that is observed in the past and now.

Part 4 is a design guideline based on the analysis of a series of precedent studies. It provides the critical architectural qualities required for urban schools for the 21st century education.

Part 5 combines the understanding of the socio-political backgrounds affecting schools in cities and using the design guidelines derived from precedents to generate an architectural response to the situation outlined in the first chapter. The design of the integrated vertical school development reveals itself as an exemplary family-focused urban development project.

Figure 10 A hollowed concrete classroom partition.

Thesis Background

The thesis began with the motivation to change the current learning condition in ageing school premises in Hong Kong. Primarily out of curiosity to discover the reasons causing such poor and dangerous schooling conditions to persist in a well-developed urban city.

I grew up as a child in Hong Kong and now living in the Greater Toronto Area. Combining the personal experiences in both cities, especially in the past few years since I became a mother of two young children, the thesis took shape into addressing the need to reflect more about the experience of children in the city and to consider family-friendly approaches while designing. The conditions of overcrowding schools and poorly maintined school facilities in urban residential neighbourhoods became the starting point for the investigations.

Finally, research and analysis are synthesized into an urban development typological approach for ageing school redevelopment projects. The proposal draws urban development focus to low-density school sites in dense urban context and families living in the city.

Part 1 | The Situation

Urban Density and Demographics Situation in Cities

Urban High-rise Developments

Rapid urbanization worldwide has forced the design and urban planning industries to invent new ways to intensify urban areas continually. For example, building taller buildings, investing in mixed-use high-rise and investigating the opportunity to develop and expand the infrastructure networks to accommodate the growing populations in cities like Hong Kong, London, New York, Toronto, and Sydney. In the recent years, much of the urban development focus is in the residential sector. The Turner and Townsend International construction market survey published in 2017 demonstrated that the global economy is on an overall steady upward trend since the drop in 2014. The study analyzed 43 key markets in the world to provide an overview of the global economy for the construction industry. The leading growth countries such as China and the USA is investing heavily in infrastructure and real estate developments. Due to constant low-interest rates, the construction of apartment buildings is leading many economies worldwide. However, the massive investment in residential apartments and condominiums in cities are also causing concerns about the overheating markets, "The apartment construction cycle is notoriously short in nature, and the construction industry is wary of the sector peaking."[1] The overheated housing market in the major Canadian cities like Vancouver and Toronto also demonstrated the booming investments in the residential development sector. The economy is leading urbanization towards building more profitable buildings, such as the high-rise private residential typology. Accommodating that is the commercial and financial high-rise that strengthens cities core economic growth. With more high-rise housing developments and jobs being created in the downtown of our cities, more and more families will choose to live in cities for its affordability and continence. The population in the core areas will continue to grow, and the need for family-oriented design must be considered at the early stages of any urban interventions in these areas.

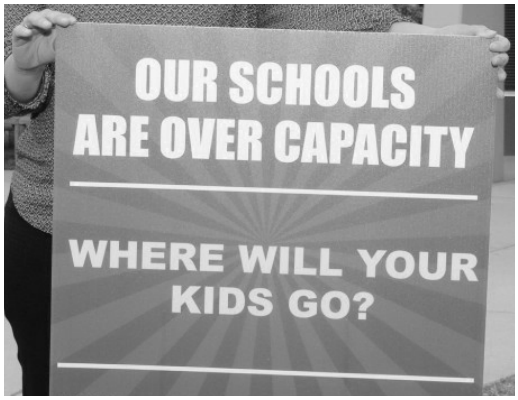


Figure 11 Our schools are over capacity.

1 Turner and Towdsend. "Global Economic Overview - Low interest rates drive apartment bubble", International Construction Market Survey 2017. 6.

Completed Residential Building or Mixed-used Building with Residential Use Since 2000

Figure 12 Graphic illustration of the number of residential development in different cities. Toronto and Hong Kong have the largest amount of residential constructions in the past two decades.

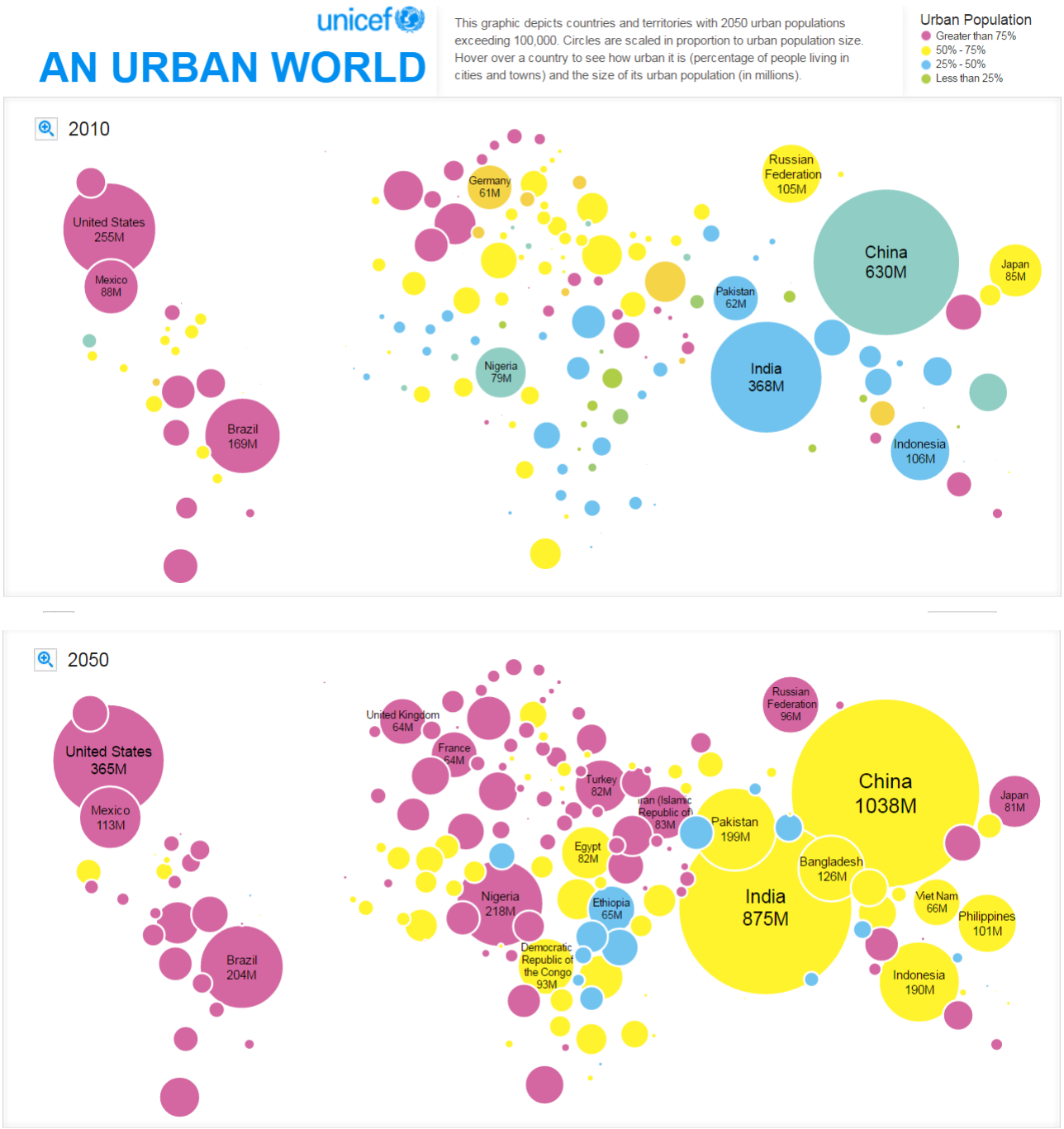


Figure 13 An Urban World. Graphic demonstrating the urban population in different countries in 2010 and a predicted growth in respected countries in 2050.

Urbanization and Urban Population Trends

The world's urban population is growing at an unprecedented rate. "Currently, 757 million people reside in the 101 largest cities, with a population of 36 million for the largest city (Tokyo), and 3.5 million for the 101st largest city (Addis Ababa); these cities are home to 11% of the world's population. By the end of the century, the world population is likely to grow, with estimates ranging from 6.9 billion to 13.1 billion; the percentage of people residing in the 101 larger cities is estimated to be 15% to 23%."[2]

Urbanization has improved the conditions of cities economically, socially, politically and environmentally. The current urban workforce is reasonably wealthier and more well-educated than the previous generations. Longer life expectancy and the baby boomer population continues to generate the increasing ageing demographic trends in cities. A significant amount of the social resources are devoted to healthcare and retirement facilities in preparation for challenges cities may face from a more significant demand of the elderly demographic. The 0-14 age group population, on the other hand, is on a downward trend. Fertility rates continue to drop, the United Nations Population Division predicts that the global average fertility will be below global replacement fertility rate by the end of the 21st century.[3]

The socio-political horizon is set to solve the broader ageing population challenges. Thus, less resources are given to developments for the children demographic group. Today, urban problems like insufficient schools and ageing school facilities have become increasingly prominent in developed cities worldwide.

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2 Hoornweg, Daniel & Kevin Pope. "Socioeconomic Pathways and Regional Distribution of the World's 101 Largest Cities" Global Cities Institute Working Paper No. 04. Jan 2014. 1.

3 Global replacement fertility rate is the total fertility rate at which the population size stays constant. UN population division.

Figure 14 Adrian Cook and his 5 children share a 1000 square-foot condo apartment in the City of Vancouver.

Yupps and the Urban Families

The Millennials, referring to the population born between the 80s and the 90s, are attracted to the urban living style due to employment opportunities and the benefits of the urban social atmosphere. The population in this particular demographic group that chooses to dwell in the urban cores is often referred to as *yuppies*. A popular term to describe the 'young urban professionals' who are "well educated, upwardly mobile in a public-, or, perhaps less commonly, a private-sector occupation in a professional or managerial capacity, single or living with a working partner, and with adequate discretionary income to engage in the rituals of the culture of consumption, expressing the canons of good taste in a designer market-place"[4]. The opportunities that urbanization has brought to the cities provide a secure financial foundation for *yuppies*, allowing them to be conveniently engaged in social activities and live close to their workplace. Newer studies show that the *yuppies* are consciously choosing to remain in the city as they begin to extend their life-cycle into the next stage - forming a family and raising children[5]. This new demographic group is referred to as *yupps*, 'young urban professional parents.'[6] Lia Karsten, associate professor of Urban Geographies at the University of Amsterdam has been researching the relationship between families with children and the urban environment, states that such demographic group has a different impact to the formation of the urban environment from that of the *yuppies*[7]. *Yupps*' lifestyle is less mobile and more oriented and structured towards their neighbourhoods. To achieve work-life balance, they often choose to live in the urban areas that have better family-friendly accommodations, such as family restaurants, available child-care facilities, schools, play spaces and most importantly social communities that provides children activities and programs. The phenomenon of urban *yupps* is common to cities in North America, Europe, and Australia.

4 Ley, David. The New Middle Class and the Remaking of the Central City. Oxford University Press, New York. 1996. 35.

5 Karsten, Lia. "Family Gentrifiers: Challenging the City as a Place Simultaneously to Build a Career and to Raise Children", Urban Studes, Vol.40, No. 12, 2573-2584.

6 Ibid. 2573.

7 Boterman, W., L. Karsten & S. Musterd (2010), Gentrifiers Settling Down? Patterns and Trends of Residential Location of Middle-class Families in Amsterdam, Housing Studies 21, 83–98.

Figure 15 View of the private outdoor amenities for a nine block private housing in Tung Chung, Lantau Island, Hong Kong.

Figure 16 An aerial view of a Hong Kong typical public housing estate in the foreground and private estates and commercial development in the background.

South-East Asia Urban Lifestyle

In many developed South-East Asian cities like Shanghai, Singapore and Hong Kong, the option to live in single-family housing in suburban context is not available. As an example, Hong Kong is home to 7.34 million people, one of the densest cities in the world. Inhabiting a total land area of 1,106km^2 spread across the Hong Kong island, the Kowloon peninsula, the New Territories and smaller islands scattered around the main territories. To put it into perspective, the size of Hong Kong is approximately twice the size of the City of Toronto. Families have no choice other than living in vertical neighbourhoods. In fact, apartment living in Hong Kong has no association with negative living conditions, because there are simply no other options. It is evident to the planners, architects, and designers that vertical housing communities in Hong Kong are made for all classes and all ages.

Living in a high-rise building does not affect Hong Kong dwellers in regards to making decisions about giving birth. Instead, the condensation of space, crowdiness in the public realm, long working hours, and high living standards, lack of family-friendly urban planning are some of the critical factors to the low fertility rates in the city. The annual growth rate for the age 0-14 population has been in the negative position since 1986.

Yupps In Hong Kong

While many young professionals decided to continue with the childless lifestyle, matured married couples are more prone to progress into the family life-stage in their late 30s-40s. For these parents, the vertical living style does not affect the quality of life. Many find that the convenience and proximity to public transportations, good schools and work more critical to structuring their everyday routine with children. “A bigger apartment was of some concern, but the apartment’s location is also very important: ‘It’s all about location, location, you know, in Hong Kong’ ” [8] a parent of young children living in Hong Kong said in an interview done by Karsten. “In this respect, parts of Kowloon and Hong Kong Island, with their ample supply of good schools and working spaces, are the most popular places to live.”[9]

8 Karsten, Lia. "Middle-Class Households with Children on Vertical Family Living in Hong Kong." Habitat International 47, 2015. 241.

9 Ibid. 244.

Vickki Elliott with Immy, 10, and Freya, 7, outside Willoughby Public School with Mandy Kevans and her children Will, 6, and Lucy, 8. Picture: Justin Lloyd

NSW

NSW schools crisis: Baby boom and high-rise housing push school enrolments to bursting point

Figure 17 News article about the lack of schools in New South Wales, Australia.

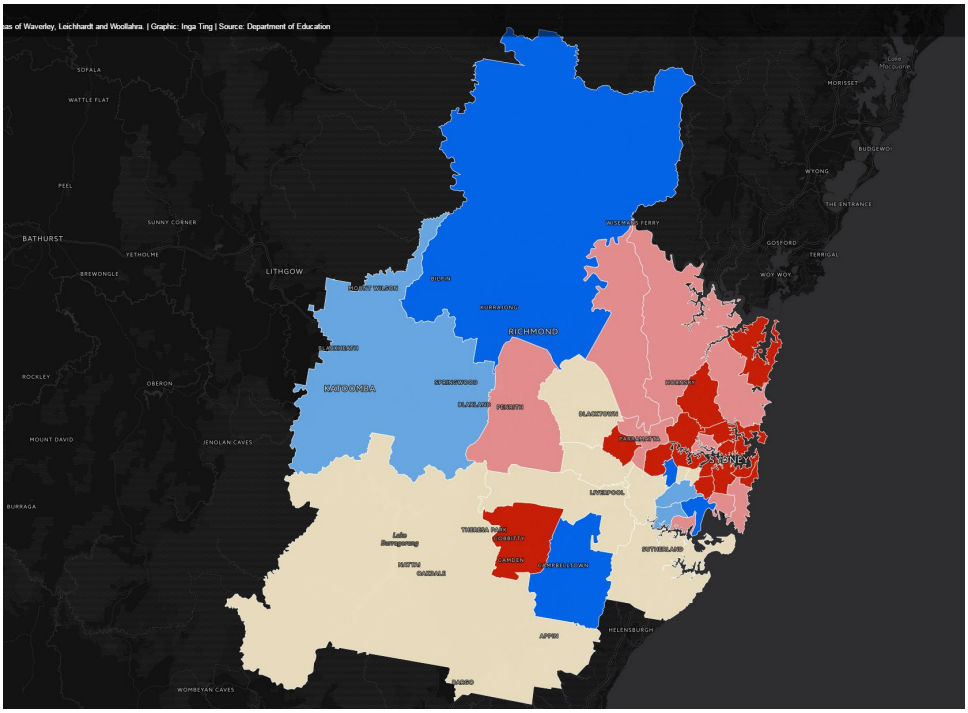


Figure 18 School enrollment growth in New South Wales, Australia. Red indicates very high (up to 23%) growth, yellow is average growth area (3-5%), blue indicates growth less than 3%.

Conclusion

The urban development situation in North America, Europe, and Australia could be entirely different from the South-East Asian mega-cities like Hong Kong. However, under the pressure of the booming high-rise housing markets, the shared phenomenon observed between the two groups of urban parents is that the priority is given to choosing a family-friendly neighbourhood when considering a place to live - and these places are close to the urban cores or in approximation to transit connection to the city center.

Evidently, schools, child-care facilities and proximity to work locations play an essential role in the decision making for housing choices. In both urban conditions, the tendency to converge in a few particular neighbourhoods that can accommodate busy family schedules and complicated family routines seem to be a mutual phenomenon. These areas are also where insufficient student accommodation becomes a problem.

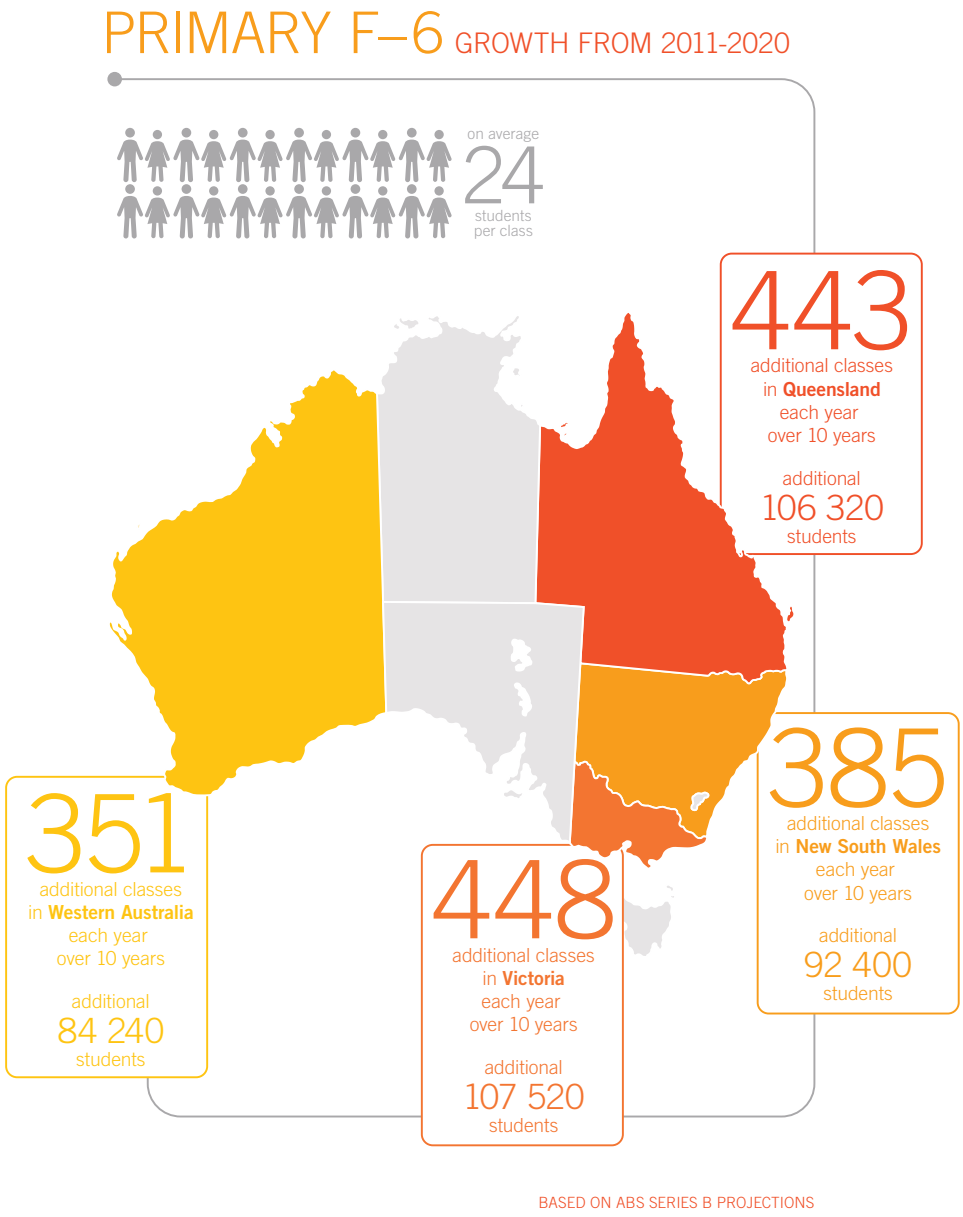


Figure 19 Australia's Rising Demand for Schools and the Current Action. Educational supply and demand analysis for each state in Australia.

The Horizon of School Planning In Major Cities

Table 3.20
Overcrowding in New York City School Buildings, 2007-2008 Through 2012-2013

	Students		Buildings	
	Number	Share of Total	Number	Share of Total
2007-2008	403,403	40.3%	527	38.4%
2008-2009	404,044	40.6%	526	38.3%
2009-2010	426,474	42.3%	541	39.2%
2010-2011	435,748	42.7%	550	39.3%
2011-2012	435,156	42.5%	546	39.5%
2012-2013	446,751	43.5%	565	41.2%

NOTE: IBO defines a building as overcrowded if its utilization level exceeds 102.5 percent.

New York City Independent Budget Office

Figure 20 A chart showing the number of orvercrowding schools in New York City. The issue has increased much more drastically in the more recent years.

In 1995, school gyms were being turned into classrooms in crowded public schools in Queens. The same thing is happening today. A new way to predict public school enrollment could help the city better tackle the problem. //
Chrystyna Czajkowsky/AP

Wanted: A Better Way to Predict Public School Enrollment in NYC

TANVI MISRA OCT 12, 2016

New York City's public schools have struggled with overcrowding for decades—and in recent years, the problem has worsened. In the 2012-2013 school year, 43.5 percent of public school students went to school in overcrowded buildings. For these kids, that means fewer teachers, larger class sizes, and fewer resources.

https://www.citylab.com/solutions/2016/10/wanted-a-better-way-to-predict-public-school-enrollment-in-nyc/503606/ 1/4

Figure 21 New York City struggles to predict public school enrollment.

London, England

In 2015 England's national council leaders predicted that 60% of areas in England would be in need for primary school spots to cope with "'unprecedented" rise in demand[10] for school spots. Many secondary schools in the country are already admitting student over the school's capacity and are forced to split classrooms as a temporary solution.

New York City, New York, USA

Overcapacity student enrollment has been a significant issue in New York City for decades. From 2007 through 2013, 43.5% of public school students went to schools in overcrowded school buildings.[11] For families, that means parents may have to choose between sending children to a school further away from home or continue to enroll in the overcrowded school where larger class sizes, fewer teachers, and fewer resources should be expected for their children.

Sydney, New South Wales, Australia

Sydney is facing an explosion of children. Current statistics forecast a 41% growth in the population of school-aged children over the next decade.[12] Overcrowded schools are already common to find in urban cores near the city. The Australian Council for Educational Research said that at 350-450 classrooms need to be built in each state every year for the next decade to accommodate the booming children population across the country[13]. More and more multi-million large-scale intensification developments projects are being constructed in the city. The government has failed to address the need for more schools in many locations. "Despite the numbers, the Department of Education has no plans to build new primary schools in key areas such as Green Square, which will become Australia's most densely populated suburb by 2030 following the influx of 61,000 residents. "[14]

10 Cassidy, Sarah. " Growing crisis over shortage of school places could lead to 'titan' secondary schools to cope with thousands of extra pupils". The Independent. September 11, 2015.

11 New York City Independent Budget Office. "New York City Public School Indicators: Demographics, Resources, Outcomes". July 2014. 38.

12 Weldon, Paul R. . Polivy Insights – The Teacher Workforce in Australia: Supply, Demand and Data Issue." Australian Council for Education and Research. March, 2015. 3.

13 Ibid. 3

14 Bagshaw, Eryk and Inga Ting. "Sydney's School Student Boom." The Sydney Morning Herald, April 14, 2016. http://www.smh.com.au/national/education/sydneys-school-student-boom-20160412-go44ij.html (accessed November 8, 2017).

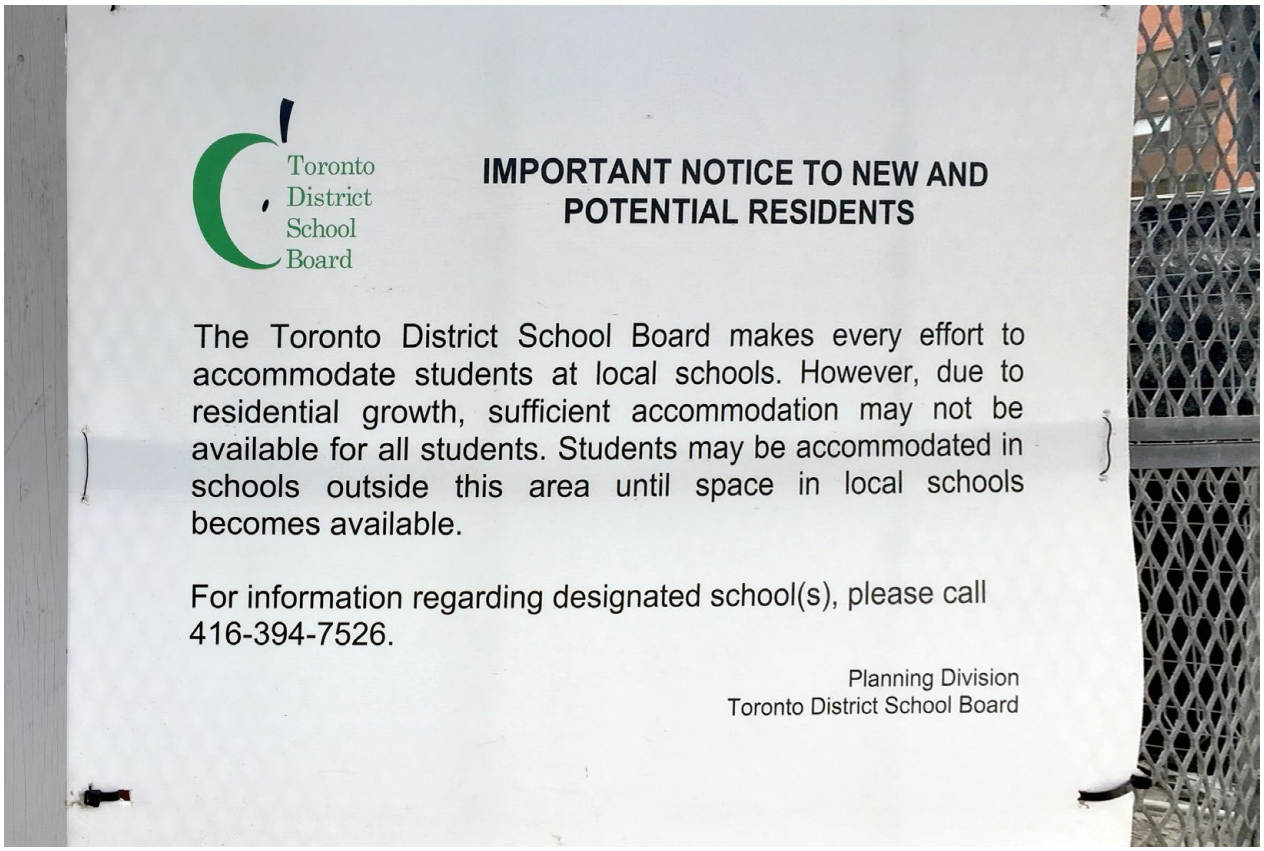


Figure 22 The warning sign posted by Toronto District School Board at construction sites in the Yonge and Eglinton neighbourhood.

Figure 23 The Bayside development by Tridel in Toronto shows how the child care's outdoor space was located on the 2nd level . A collaboration between the developer and City Planning and Children Services.

Figure 24 The North Toronto Collegiate Institute is integrated into the base of two residential towers. School amenities, including a theatre, classrooms and sports fields, are available to the community outside of school hours.

Toronto, Ontario, Canada

In Toronto, numerous residential developments rising in the downtown core to the mid-town area this past decade are posing tremendous pressure on the Toronto District School Boards(TDSB) to accommodate local student spots. At multiple condominium construction sites in the Leslieville and Mid-town Toronto neighbourhoods, signs posted by the TDSB warns potential new home buyers that a local student placement may not be guaranteed.[15] TDSB announced that a total of 110 new developments in Toronto carry this warning notice.[16] This situation means that more students will be living outside of the 1.6-kilometer acceptable walking radius and will be required to be bused out to attend a school further away from home[17]. On the other hand, unbalanced school enrollment numbers are causing 130 elementary and secondary schools across Toronto to be operating at less than 65% utilization rate. Approximately 1 in 5 schools might have to face closure as the TDSB struggles to keep its under-utilized properties in use[18].

Toronto, being one of the fastest growing cities, has an 18% population growth rate since 2006. The most significant development growth category identified in the latest downtown urban intensification study is the high-density housing development type.[19] "Between 2006 and 2016, over 143,000 new dwelling units were constructed in the City of Toronto, 80% of which were in buildings greater than five storeys. Increasingly, families with children are calling these buildings home."[20] To address the issue, the City of Toronto Planning Department released a draft guideline in regards to planning for children in new vertical communities in May 2017, affirming that the city's growing interest in addressing the need for schools in densified areas. A few case studies presented in the this document have demonstrated the possibility to integrate a child-care facility or a school into the community or the housing developments.

15 Farooqui, Salmaan. "Leslieville just one of several Toronto neighbourhoods with a shortage of schools". The Canadian Press (Toronto), September 4, 2017.

16 Ibid.

17 Goodfield, Kayla. "TDSB warns Leslieville residents of school shortage". CTV News Toronto, May 12, 2017. http://toronto.ctvnews.ca/tdsb-warns-leslieville-residents-of-school-shortage-1.3411722 (accessed November 8, 2017).

18 Howlett, Karen and Sahar Ftima. "One in five Toronto schools target for possible closing". The Globe and Mail (Toronto). Januray 28, 2015. https://beta.theglobeandmail.com/news/toronto/one-in-five-toronto-schools-underused-tdsb-says/article22695328/?ref=http://www.theglobeandmail.com&from=22715877 (accessed November 8,2017).

19 Ostler, Thomas "Trends, Issues, Intensification – Downtown Toronto". Report. City of Toronto, City Planning – Toronto and East York District. May 2014. 11.

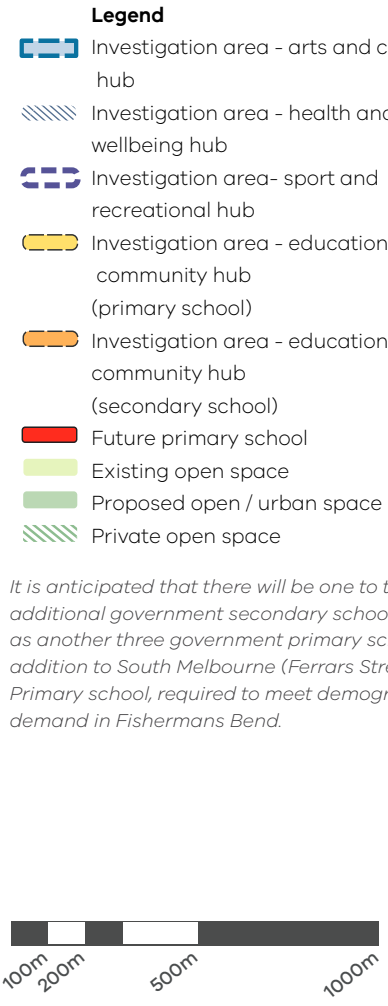
20 City of Toronto Growing Up: Planning for Children in New Vertical Communities Draft Urban Design Guidelines, May 2017.

Figure 25 Community facilities and service plan for the Fishermans Bend urban renewal project indicating potential collaborative school and community mixed-use high density developments.

"Co-locate community services and facilities with new development to ensure shared use as well as efficient, inclusive and dynamic program delivery."[21]

Community facilities and services

Figure 15



It is anticipated that there will be one to two additional government secondary schools, as well as another three government primary schools in addition to South Melbourne (Ferrars Street) Primary school, required to meet demographic demand in Fishermans Bend.

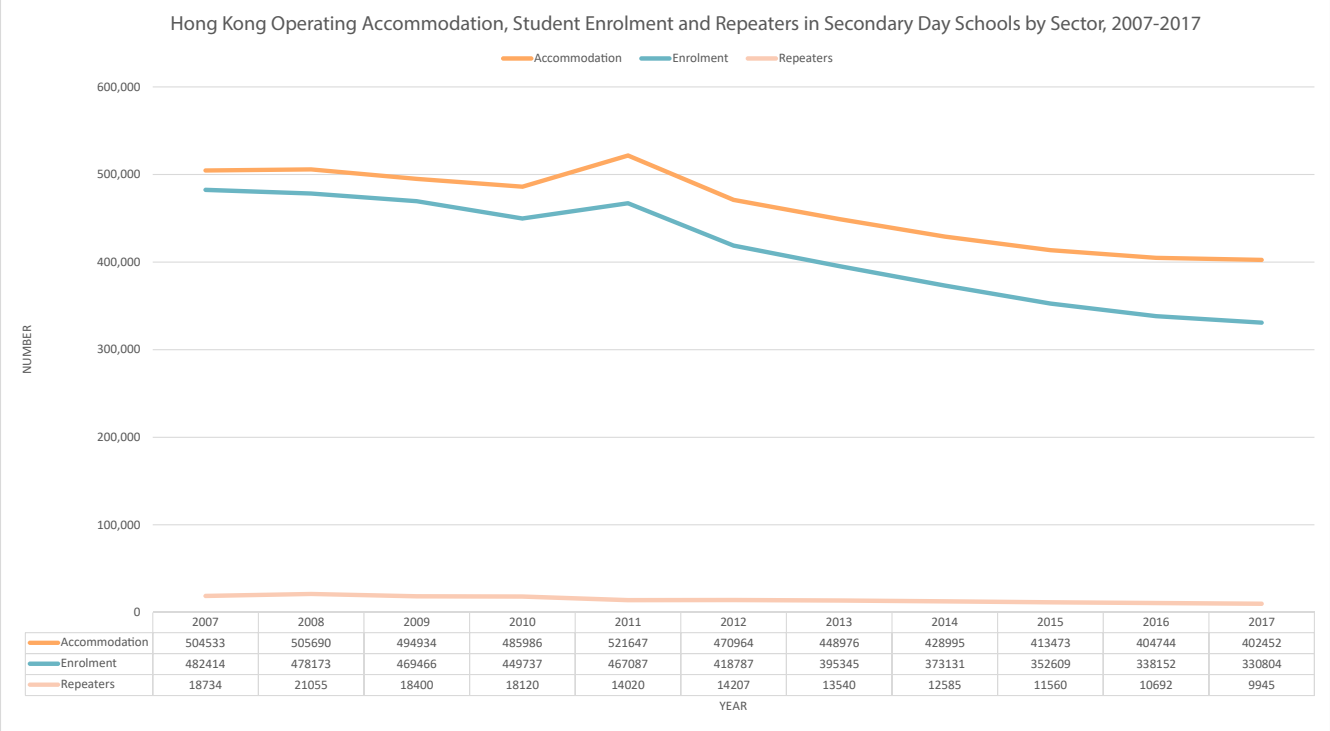
Proactive Urban School Planning in Melbourne, Australia

Fishermans Bend, Melbourne, Victoria, Australia

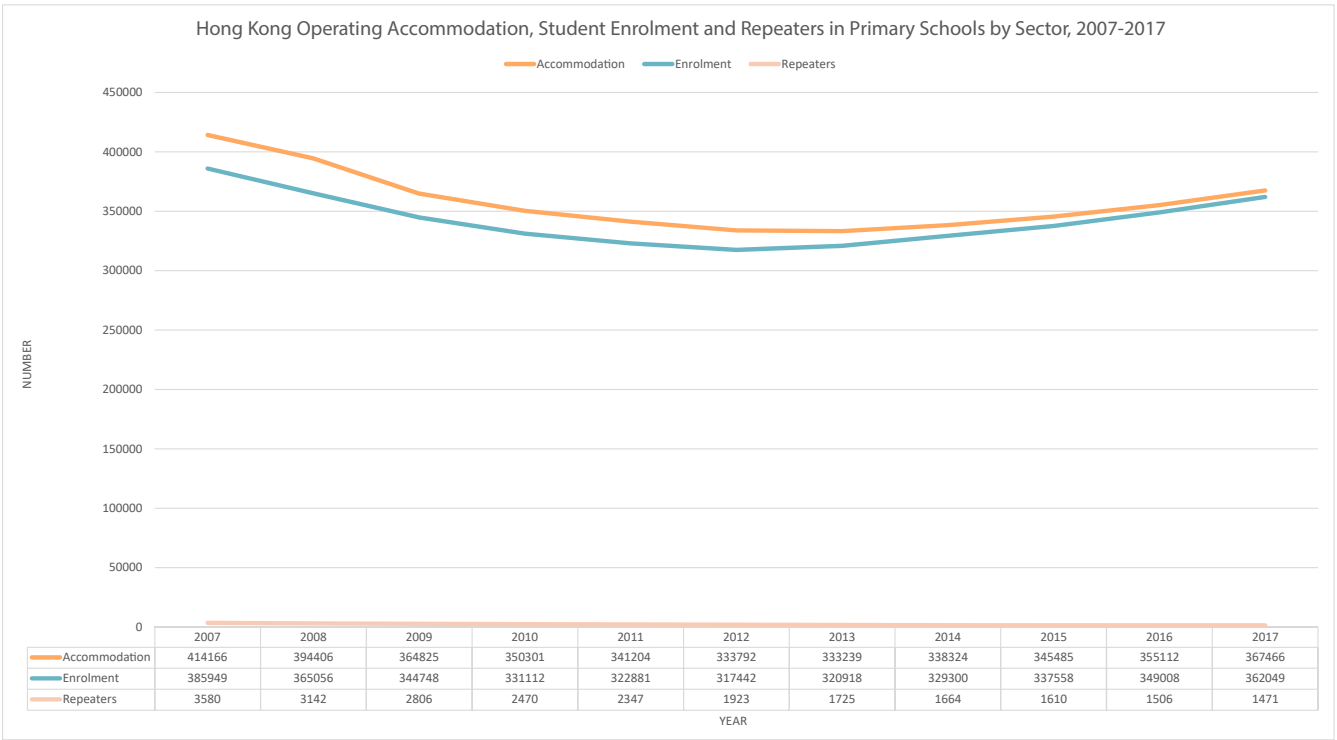
The state of Victoria in Austria is in the process of master planning the largest urban renewal project for 2050. Located between Port Melbourne and South Melbourne industrial area, the redevelopment area covers approximately 455 hectares of land in the inner city. The final state of the 35-year plan is expected to be home to 80,000 residences and will generate up to 80,000 jobs. Officials are anticipating one in three families living the redeveloped area to be families have children. One primary school and one newly built secondary school have already been located in the current draft plan; five additional schools are expected to cover the demographic demand. To achieve that goal, investigation in developing school facilities with community access is in progress to maximize land use efficiency and access opportunity.[22]

21 Ibid. 23

22 Victoria State Government. "Fishermans Bend Framework: The next chapter in Melbourne's growth story – draft for consultation". Melbourne: Victoria State Government, 2017. Accessed July 15, 2018.



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Accommodation	504533	505690	494934	485986	521647	470964	448976	428995	413473	404744	402452
Enrolment	482414	478173	469466	449737	467087	418787	395345	373131	352609	338152	330804
Repeaters	18734	21055	18400	18120	14020	14207	13540	12585	11560	10692	9945



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Accommodation	414166	394406	364825	350301	341204	333792	333239	338324	345485	355112	367466
Enrolment	385949	365056	344748	331112	322881	317442	320918	329300	337558	349008	362049
Repeaters	3580	3142	2806	2470	2347	1923	1725	1664	1610	1506	1471

Figure 26 Hong Kong student enrollment trends.

Secondary school enrollment drops while Primary schools enrollment rises. Within the next decades, the declining secondary school accommodation figure will meet an increasing enrollment figure as the primary school demographic graduates.

A Rising Issue in Hong Kong S.A.R., China

Is Hong Kong Ready for An Upturning Children Population?

The average annual growth rate returned to a positive growth trend in 2016 for population age 0-14 after a continuous decreasing trend in the past decade.[23] Additional children living near the border between the Shenzhen, China who are born in Hong Kong to mainland parents[24] are also competing with the local students for school placements, especially in northern New Territories districts. In 2017, accomodations for primary students were barely surpassing enrollment by approxmimately 4000 spots. A local student spot may no longer guaranteed in the near future. If accommodations do not increase, students will need to be competitive with academic and personal achievements as early as the age of 4 to be accepted by schools in the local neighbourhood. Secondary school accomodations trends should be reversed to be prepared for enough spots for primary students graduating within the next decade.

"a single-minded focus on residential housing will affect Hong Kong's liveability." [25]

Potential Sites: Outdated Schools Renewal

The government has been neglecting school buildings in the past decades in exchange for more profitable civic and economic investments. Many older schools are expected to be naturally phased out as suggested by demographic trends in the past decade. Without the support from the officials, institutional organizations and parents become the primary financial support for schools. Based on the size of the organization and the demographic backgrounds of the families, the individual condition for each school varies. As a result, many public or government-aided school buildings built in the mid-to-late 20th century have yet to be updated to meet current building code standards. These schools operating in older and deteriorating buildings are anticipating provision for a new school location, or otherwise, facing closure because of the poor enrollment statistics and the deprived building conditions. While newly built schools are slowly emerging in parts of the city, plenty of the older schools urgently await for building re-provisioning. Allocating available land in a location close to the original school is challenging, and the administrative process can be long and discouraging. Many of these school sites are at locations close to the local residential neighbourhoods. The possibility to redevelop these outdated schools can increase the current student accomodations.

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23 Census and Statistics Department , "Hong Kong Population By-census, population growth". 20 July, 2017.http://www.bycensus2016.gov.hk/en/bc-population-growth.html. Accessed Dec 12, 2017.

24 Government policies terminated the rights for mainland citizens to give birth in Hong Kong in 2013. http://www.scmp.com/news/hong-kong/education-community/article/2109337/schools-hong-kong-feel-effects-children-heading. Accessed Dec 12, 2017.

25 Ian Brownlee, " Urban planning must reflect Hong Kong's great need for community and open space". South China Morning Post. Jun 10, 2014. Access Dec 12, 2017.
Ian Brownlee is the founder and managing director of Masterplan Lmited based in Hong Kong. He is a professional town planner who has offical planning experience in New Zealand and Hong Kong. Including the Hong Kong government and many NGOs.

Figure 27 Interior and exterior view of Man Kiu Primary School.

Man Kiu Primary School is an older school facility, its exterior wall and window condition requires constant maintenance. (Top left) Typical classrooms are only equipped with outdated lighting fixtures and furnitures. (Top right) Man Kiu Primary School's entrance flooded on a rainy day. (Bottom left) Music classroom with minimal acoustical separations from the adjacent classrooms. (Bottom right)

Figure 28 Kowloon Tong Bishop Walsh Catholic School

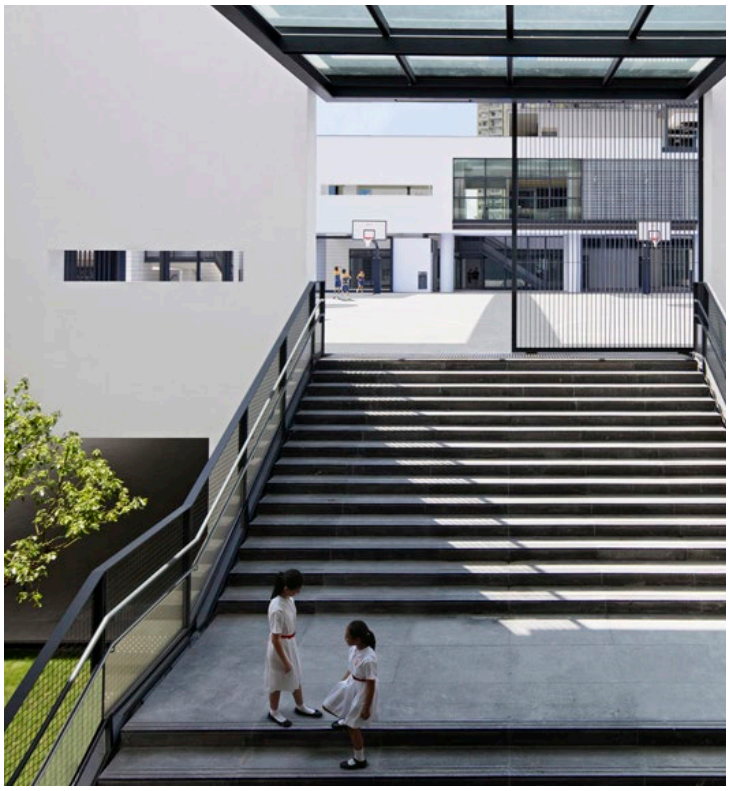

Figure 29 Kai Tak Primary School grand staircase.

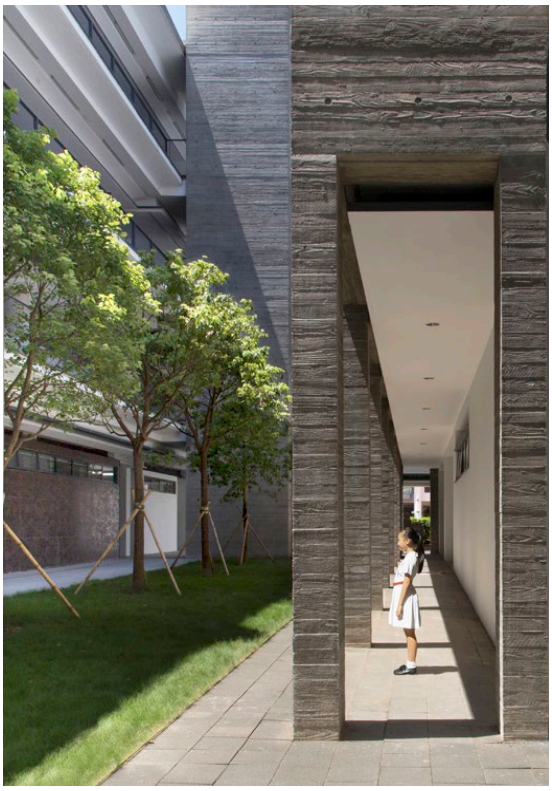

Figure 30 Kai Tak Primary School courtyard and outdoor corridor.

Examples of newer public schools where custom architectural and landscape features improves the quality of the learning environments. Larger outdoor open spaces and recreational facilities are also provided.

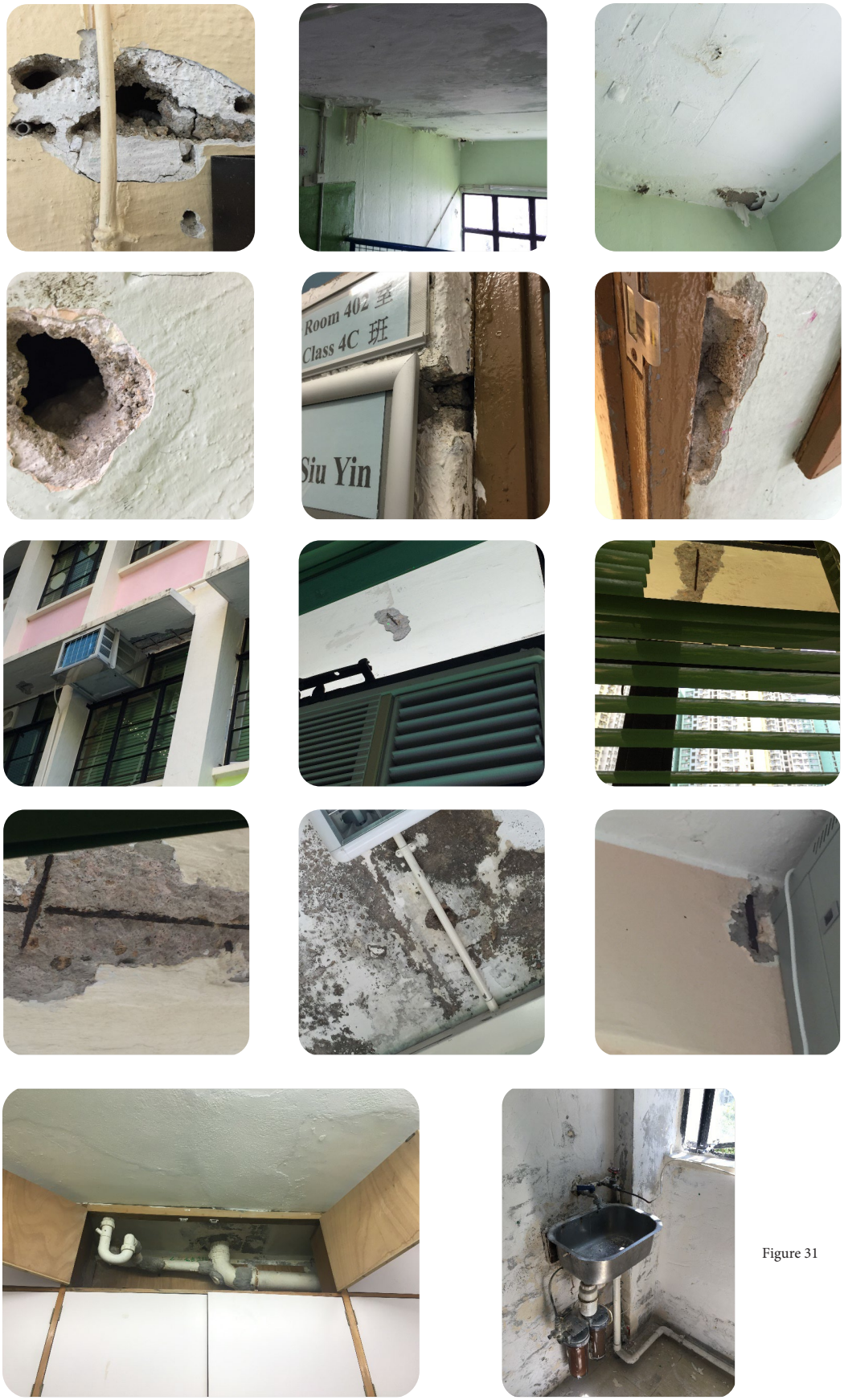

Figure 31 Interior and exterior building conditions at one of the "matchbox" schools.

The Hong Kong School Evolution:

School development has gone a long way since the earlier roof-top schools developed in the last century. The collaborative efforts put into improving the educational environments and the policies in Hong Kong have changed the landscape of school designs.

Early typologies focus heavily on the provisioning of classroom spaces, to meet the increasing student number due to government policies, immigrants and the baby-boomer generation. Then, the focus shifted to improving the educational variety and recreational facilities. School sites became bigger, to provide spaces for special classrooms and sports facilities for students. Due to the limitation of land, the concept of shared facilities and school-community integration emerged.

In the more recent years, Hong Kong school design has been driven by new pedagogical methods and sustainability. The influences began when private international schools began to develop their school facilities without having to follow so strictly to the government schools design standards. These campuses became highly desired because it contrasted with the traditional Chinese learning environment and provide students with a more flexible learning experience. Environmental concerns and teachings due to global warming signs have influenced building systems, massing and many designs focus on the new schools. The government has become more encouraging about unique, innovative contemporary school designs and is less concerned about the mass production of the same type to standardized schools across the city.

A Focus on the "Matchbox" Schools

The "Matchbox" school architecture was designed by the Government Buildings department in the 1960s. Most of the original "Matchbox" schools are half a century old at this point. Recently, through field research and building investigations, these buildings are categorized as "sub-standard" structures[1]. The structural integrity of these ageing buildings is in doubt and that the compacted facility typology cannot provide an educational environment that meets the current educational standards. Despite the poor physical circumstances, educators still strive to teach and provide the best learning experience for children and youth. This is the case for many other sub-standard schools in Hong Kong. Most of these schools have been granted very little funding and attention in the past few decades for maintenance and renovation.[2]

1 Hong Kong Legislative Council. "LC Paper No. CB(4)729/15-16(02). Background Brief on Issues Related to Re-provisioning and Redevelopment of Sub-Standard School Premises Meeting on March 22, 2016." Council Business Division 4. Legislative Council Secretariat. 16 March 2016.

2 Ip, Kin Yuen (葉建源). "「改善校舍刻不容緩」立場書". Office of Ip Kin Yuen Legislative Councillor (Education Constituency). June 2016. http://www.ipkinyuen.org.hk/file_8public/20160620_ms_rpt.pdf

Figure 32 Rooftop conditions at one of the "matchbox" schools.

High Salt Content in The Concrete Mixture

The older school buildings built before the 1960s that are still in use today are mostly government schools or privately sponsored schools that have the resources to correctly maintained the building structure. The "Matchbox" schools are one of the older subsidized school typologies that were built when the construction industry was not so technologically advanced. The concrete mixture in these buildings contains a high volume of salt water due to high construction volume and tight time line which causes the reinforcing material and the concrete to deteriorate at much faster rates.[3]

Some of these sub-standard schools are falling apart day by day – due to old concrete construction techniques. One of the principals admits that a walk around the school every morning has become part of her routine to spot any potential of crumbling ceilings or walls. Aside from its material and structural concerns, these schools also struggle to provide an appropriate learning environment for the current education requirements. Comparing them to the newer 21st-century schools, which are built to meet the current educational facilities guidelines and constructed to suit individual school goals, these older schools often find themselves battling with the building for flexibility.

Possibility for Relocation or Redevelopment

As of today, 28 "Matchbox" buildings are documented by the officials as subsidized primary schools, and only 2 of them were permitted to relocate as the buildings have become too dangerous for the occupants or due to other urban redevelopment plans.[4] These schools were built within or nearby a standard Hong Kong government-built housing estate (in lower-income neighbourhoods within the old district centers). Since new buildings have taken over the surrounding lands, they are bound within a tiny piece of land with very little or no room to expand. The school is also required to cover a portion of the redevelopment of the building at the current location if relocation to another building is not acceptable.[5]

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3 Falah M. Wegia. "Effect of seawater for mixing and curing on structural concrete". The IES Journal Part A: Civil & Structural Engineering, 3:4, 235-243, DOI: 10.1080/19373260.2010.521048

4 Hong Kong Legislative Council. "LC Paper No. CB(4)729/15-16(02). Background Brief on Issues Related to Re-provisioning and Redevelopment of Sub-Standard School Premises Meeting on March 22, 2016." Council Business Division 4. Legislative Council Secretariat. 16 March 2016.

5 Education Bureau. "LC Paper No. CB(4)321/15-16(03). Policy and programme on improvement of the teaching and learning environment of public sector schools for Discussion on 14 December, 2015". December 8, 2015.

A Time To Change

The "Matchbox" schools in Hong Kong are built for the traditional learning methods - the factory model of standardized pedagogy. Hong Kong has also begun to further implement family-oriented planning strategies as a way to deal with the ageing population challenges. It is time to look at the places in the city for the children and their families. An update to the matchbox school typology is inevitable, the condition of the original buildings is far too behind to be adaptively modified for new use.[6] The thesis design proposal, therefore, takes on the school typology as a starting point for an investigation into a brand-new school building typology at confining urban school sites.

6 Ip, Kin Yuen (葉建源). "「改善校舍刻不容緩」立場書". Office of Ip Kin Yuen Legislative Councillor (Education Constituency). June 2016. http://www.ipkinyuen.org.hk/file_8public/20160620_ms_rpt.pdf

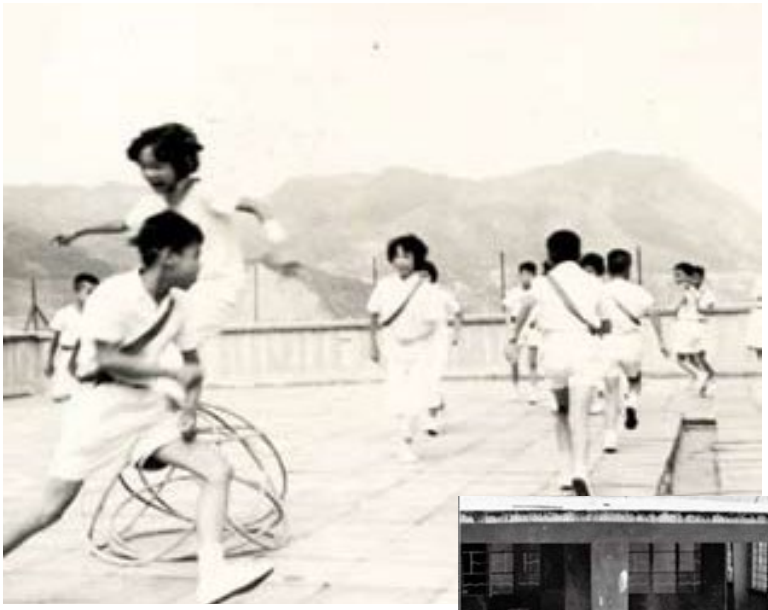


Figure 33 Hong Kong rooftop school.

THEN...

- Heritage Schools
- Roof-top Schools
- Government Pubic Schools
- Annex Schools
- Matchbox Schools
- Standard Schools
- Interlocking/ Half-Interlocking Schools
- Flexi-Desing Schools
- Millennium Schools
- Innovative and Sustainable 21st-Century Schools
- Other Types: International School Campus

Figure 34 Kai Tak Government Primary School classroom and playground.

Transformation of School Typologies in Hong Kong

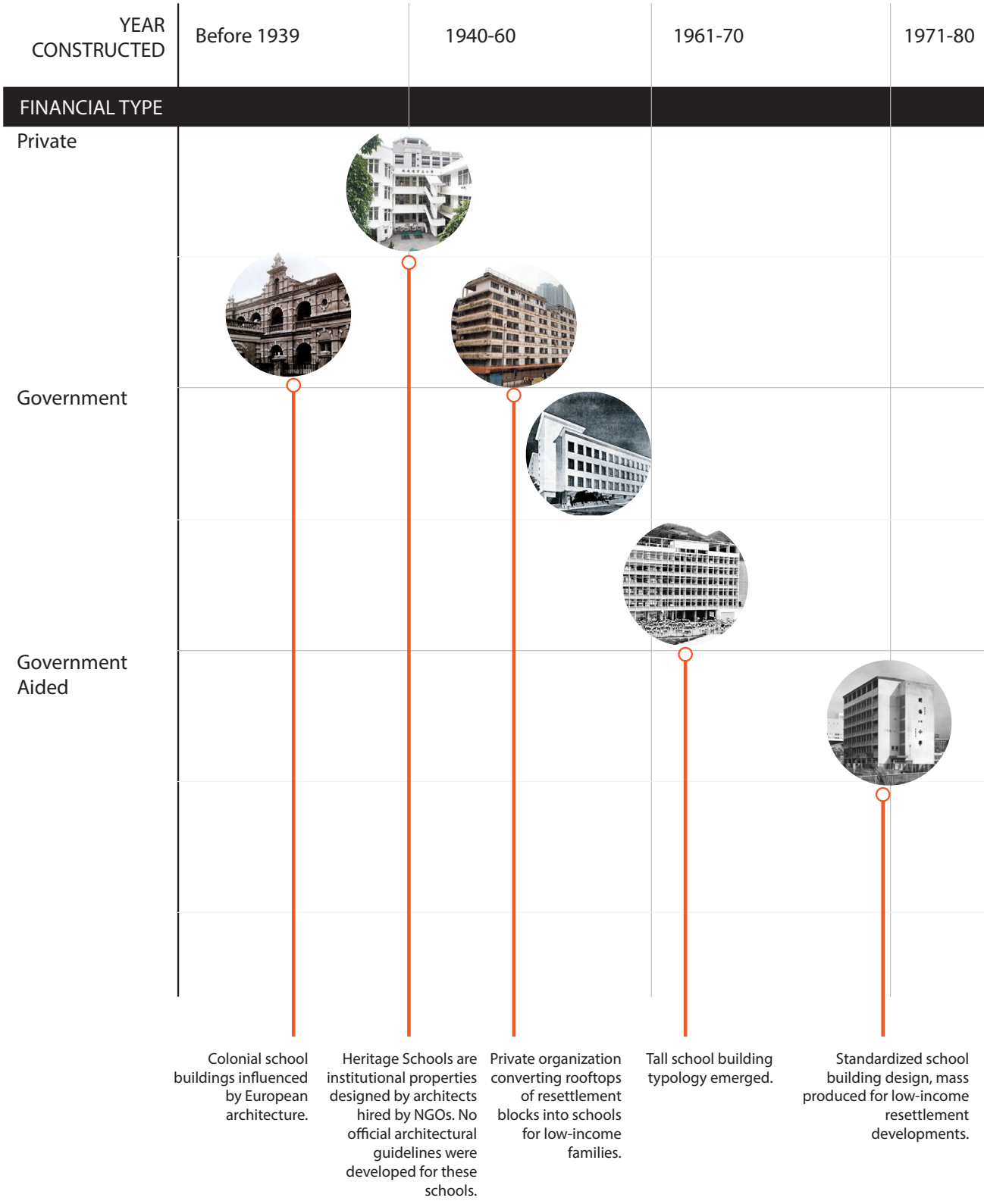


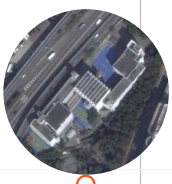
Figure 35 Hong Kong school typologies

1981-90

1991-00

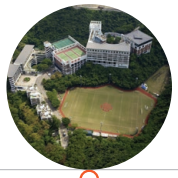
2001-10

2010-Present



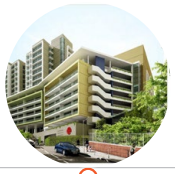
Multi-complex "interlocking" school facilities and the beginning of facility sharing.

Double loaded corridor typology replaced by single loaded exterior corridor design.



International schools setting an example of flexible learning environments for traditional schools in Hong Kong.

"School village" developed where multiple schools shares the common recreational facilities with the community.



Customized school facilities designed to suit the specific school directions. Sustainable school design, complex spatial features, and new school facility material palette. Incorporation of educational concepts are more prominently reflected in the architecture.

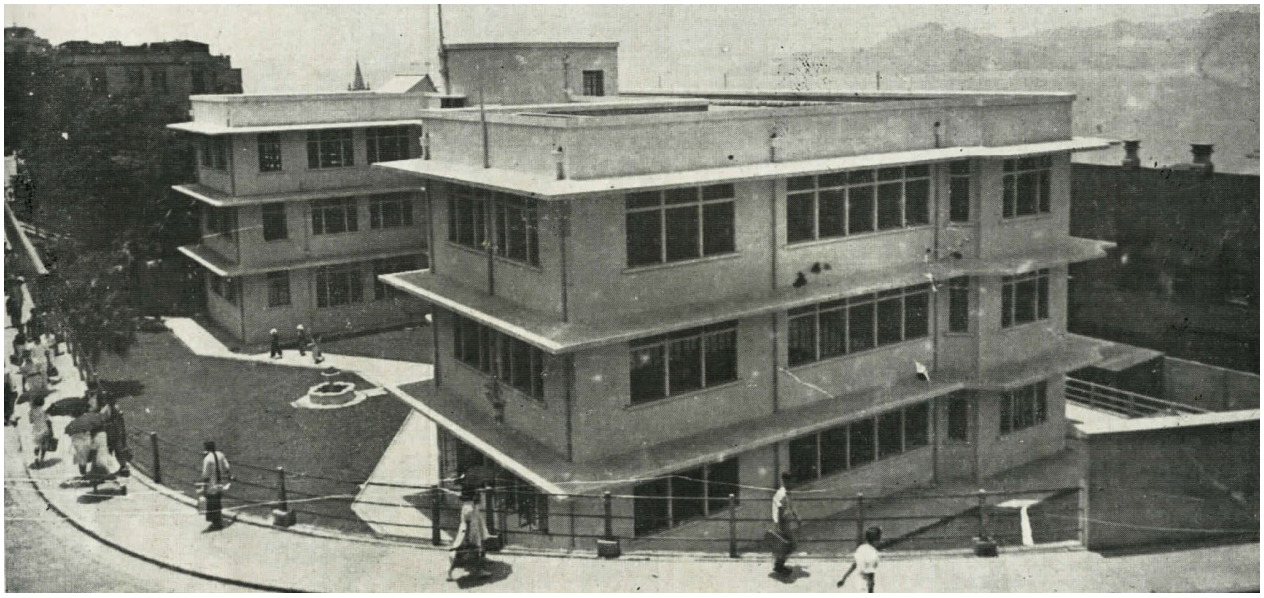


Figure 36 Exterior View

Figure 37 View of building from courtyard.

Name of School: Li Shing Primary School (Originally Northcote College of Education)
Year Built: 1939
Location: Western Hong Kong Island
Financial Type: Government (Originally privately owned)

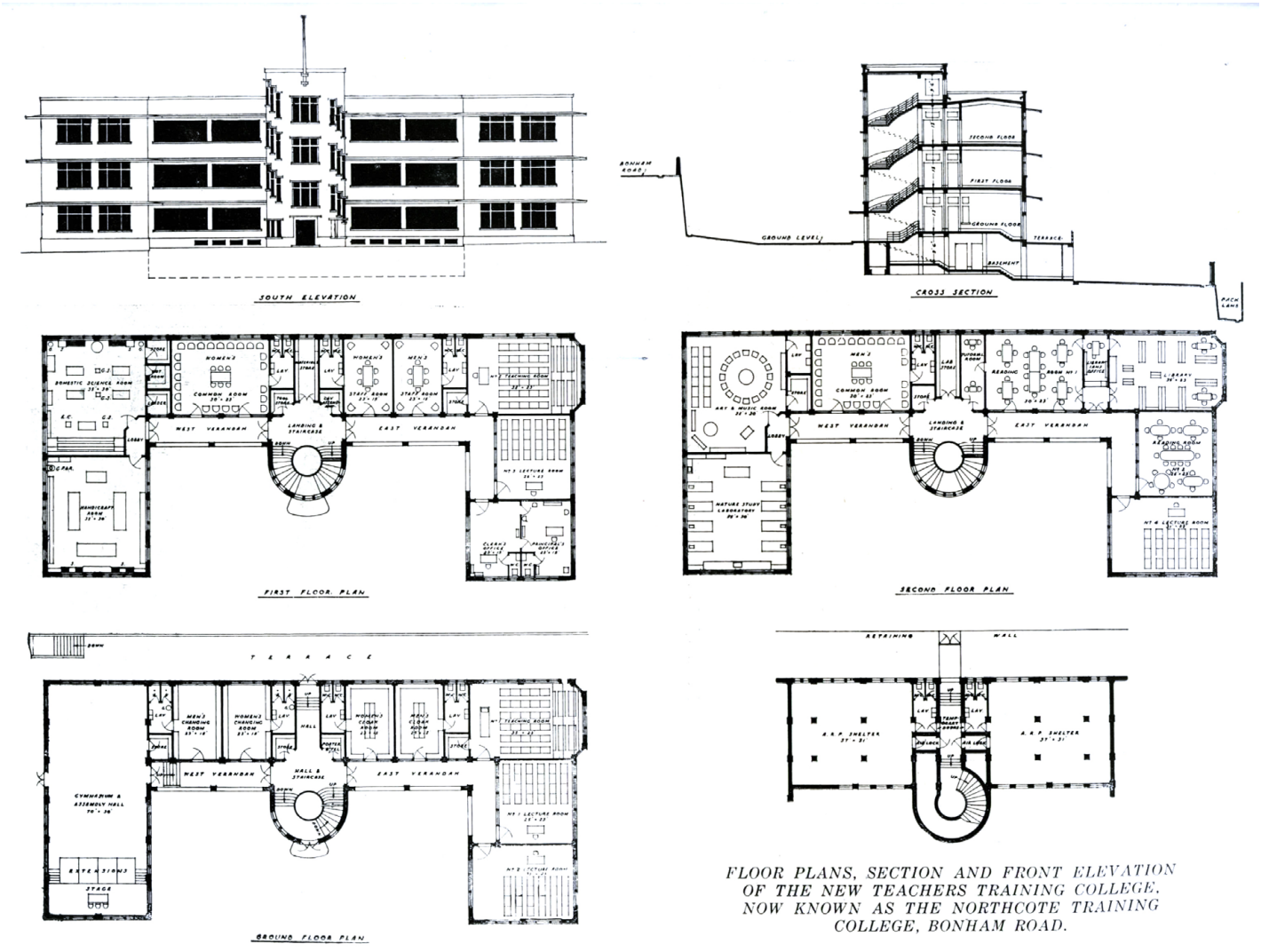


Figure 38 Bonham Road Government Primary School Drawings

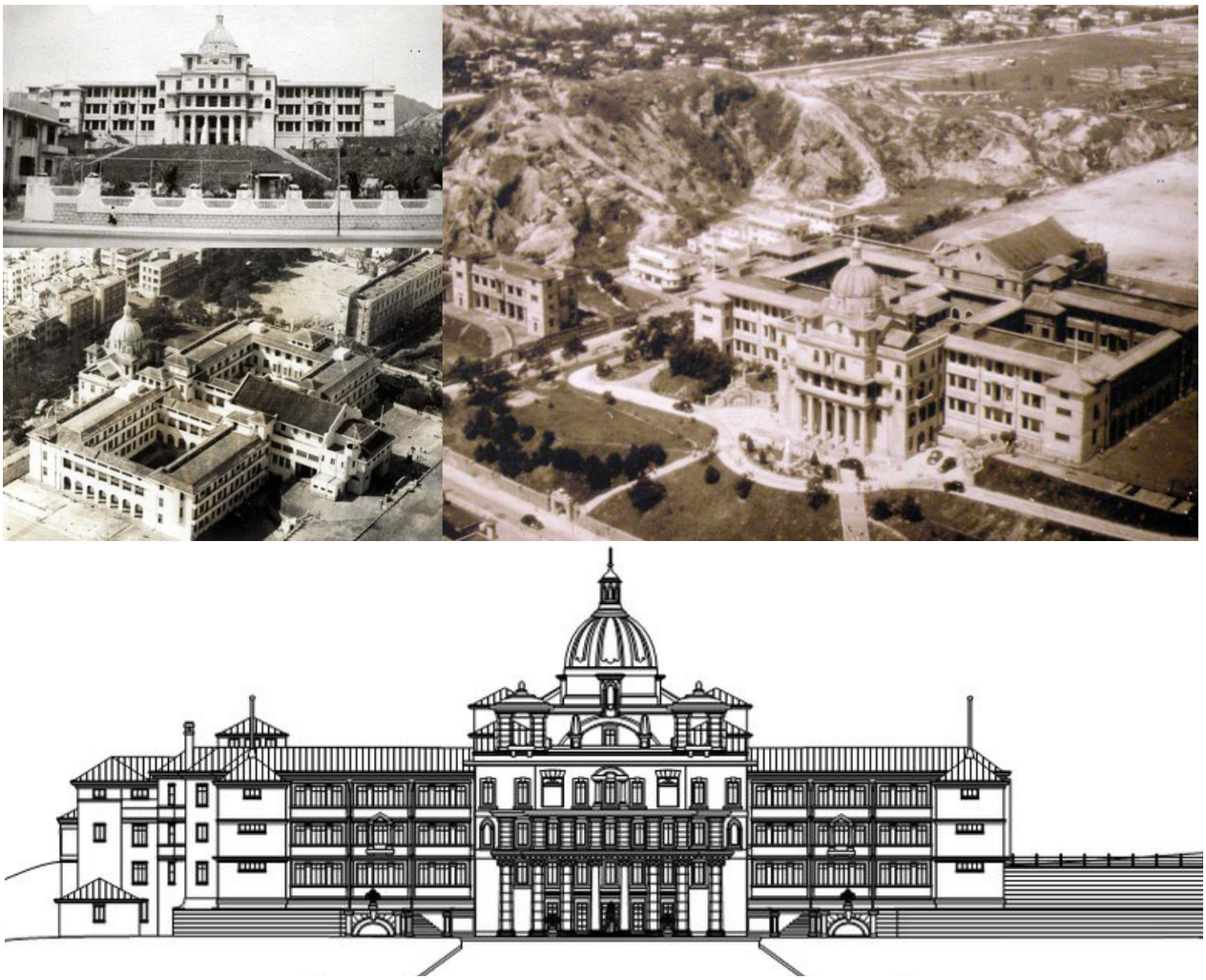


Figure 39 LaSalle College Drawings -

Name of School: La Salle College
Year Built: 1932
Location: Kowloon Tong, Kowloon
Financial Type: Private

In 1930 the Brothers of the Christian Schools (La Salle Brothers), a Roman Catholic religious teaching group, built the La Salle College. The school was advanced and large enough to hold over 1000 students. The building was used as an internment camp and a hospital during the Second World War.[1] Classes resumed at the school premise soon after the war. The original building was demolished and replaced by a new school structure completed in 1982.

1 La Salle College. "College History". La Salle College. 2018 <https://www.lasalle.edu.hk/eng/college_history.html>. Accessed November 16, 2017.

Rooftop Schools

Rooftop school classroom and playground

6th floor rented out as school offices and staff dormitory

Domestic units

Retail and domestic units

Name of School: Shek Kip Mei Estate Rooftop School
Year Built: 1950s
Location: Shek Kip Mei, Kowloon
Financial Type: Private

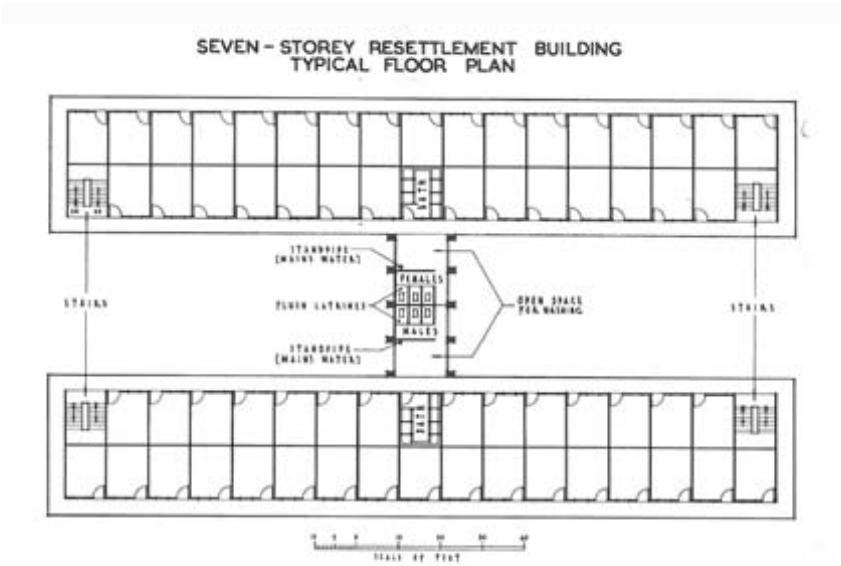


Figure 40 A typical resettlement residential building block for low-income families.

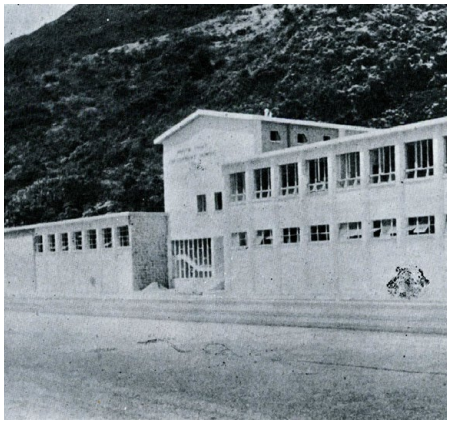


Figure 41 North Point Primary School - Original premise in the 1950s

Figure 42 Current building at the existing location.

Name of School: North Point Government Primary School
Year Built: 1954
Location: North Point, Hong Kong Island
Financial Type: Government
Area: 9000m²

Two-storey L-shaped government school. The low-rise schools are soon replaced by tall building type to meet population demands.

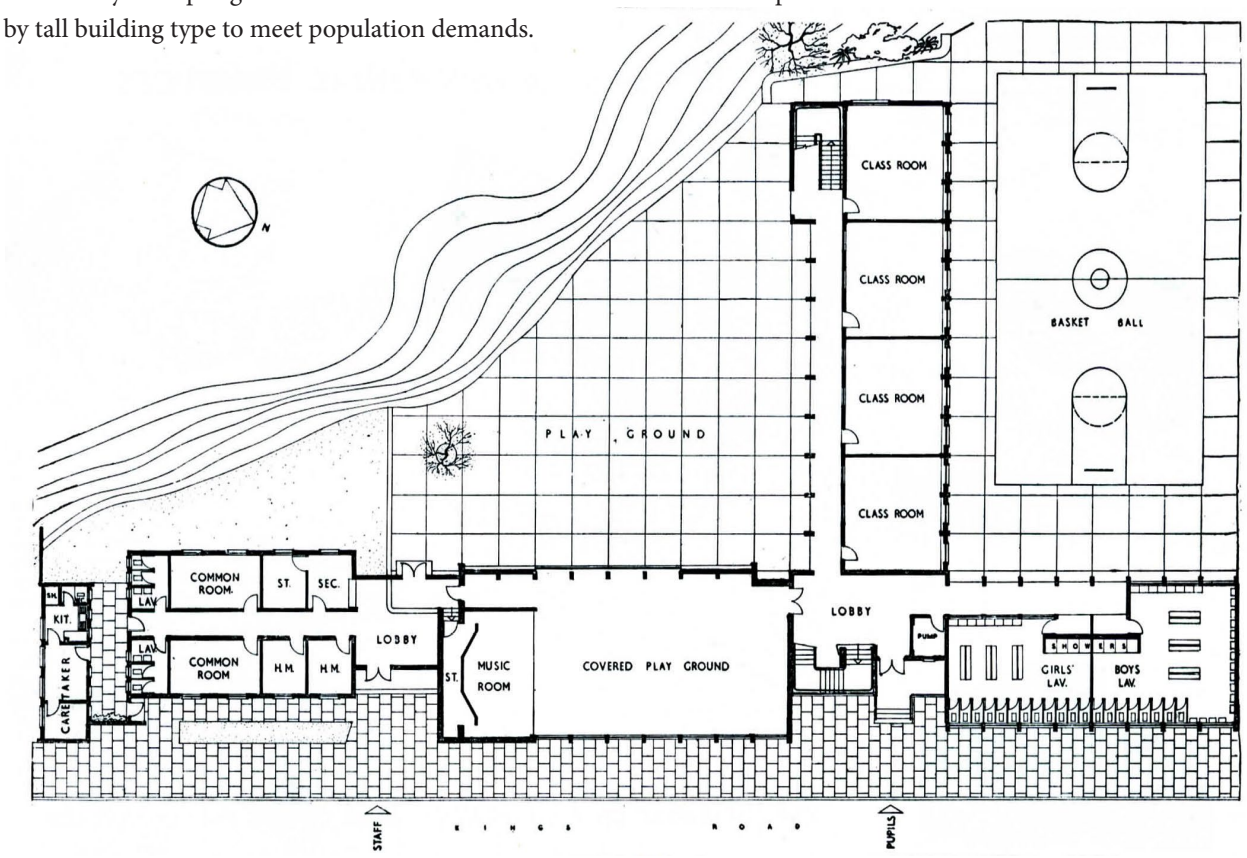


Figure 43 Current building at the same location (top right). Ground floor plan of the North Point Government Primary School, original layout.

Name of School: Farm Road Government Primary School
Year Built: 1956
Location: To Kwa Wan, Kowloon
Financial Type: Government
Lot Size: 2500 m^2

Government school built before the "Fisher Report" - a government proposal to built and operate 5 new schools in each district each year. The Farm Road Government Primary School is a 4 storey, 24 classroom school located in central Kowloon. The ground floor classrooms can be covered into an indoor assembly space. The courtyard is a school size outdoor basketball court.

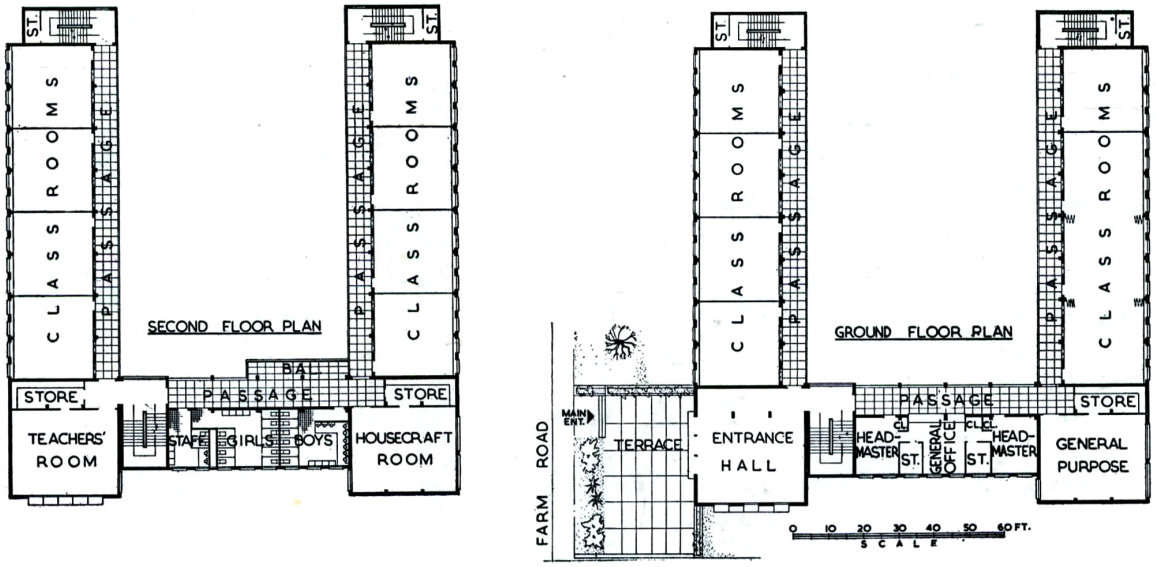


Figure 44 Farm Road Government Primary School

Figure 45 The school building is currently used by The Salvation Army Centerline Charity Fund School

Name of School: Chai Wan Government Primary School
Year Built: 1960s
Location: Chai Wan, Hong Kong Island
Financial Type: Government
Area: 4000m²

In 1951 the Government began to built and operate new primary schools in every district. The 6 storey school buildings were normally designed in an L-shape, with a basketball court, an assembly hall or a covered playground on the ground floor. Once a site-specific approach to building design was adopted, these public schools served as good models for future school building designs.

Figure 46 Chai Wan Government Primary School

Annex Schools

Figure 47 Connection between the school and the residential development.

Name of School: Po Yan Catholic Primary School (now Po Yan Oblate Primary School)
Year Built: 1965
Location: Kowloon
Financial Type: Government Aided
Area: 1665m²

This is the only annex school left in Hong Kong. The 6 storey linear school building houses 24 classrooms and is directly attached to the nearby public housing estate. There are 6 classrooms on each typical floor with a covered playground/assembly hall on the ground floor. The typology was abandoned and replace by the stand-alone matchbox school due to security issues and criminal incidents within the estates.

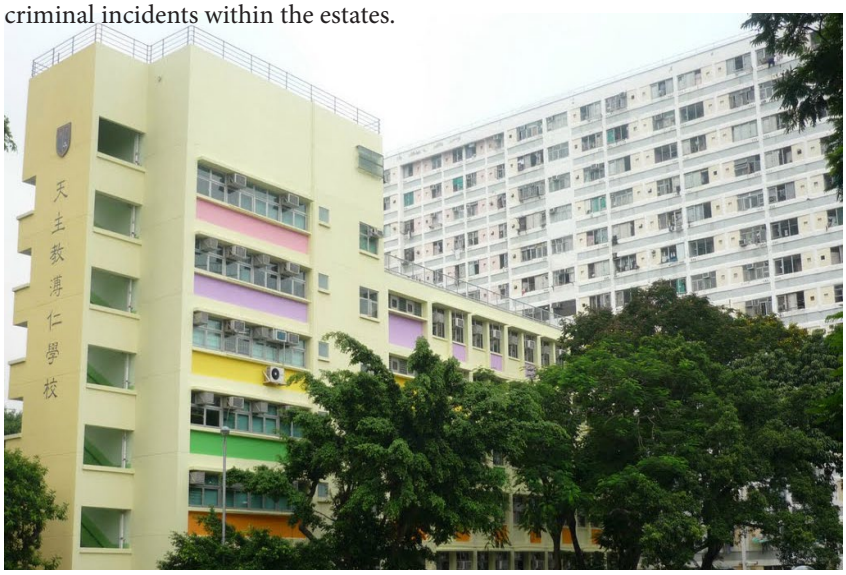


Figure 48 Po Yan Catholic Primary School

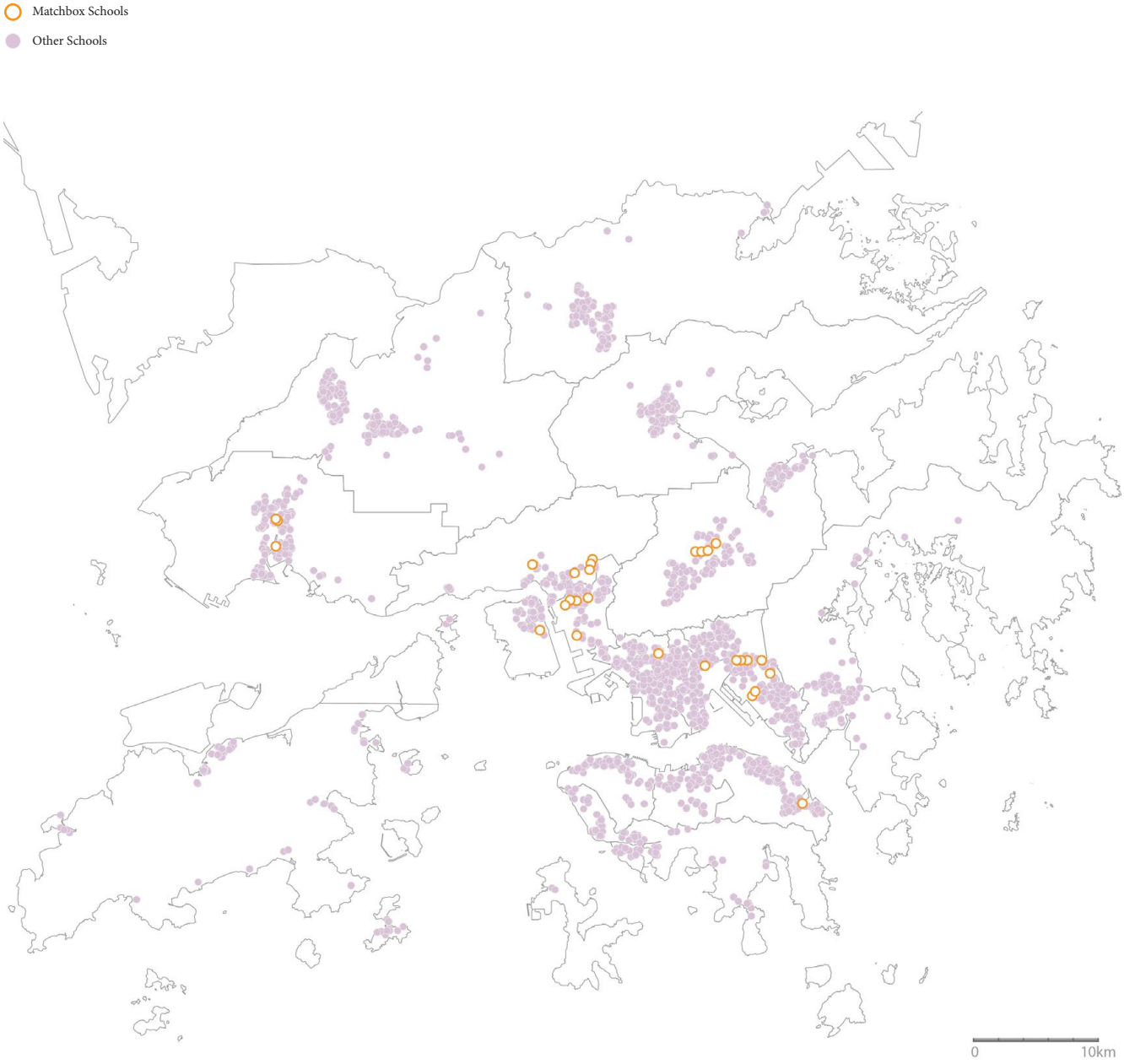
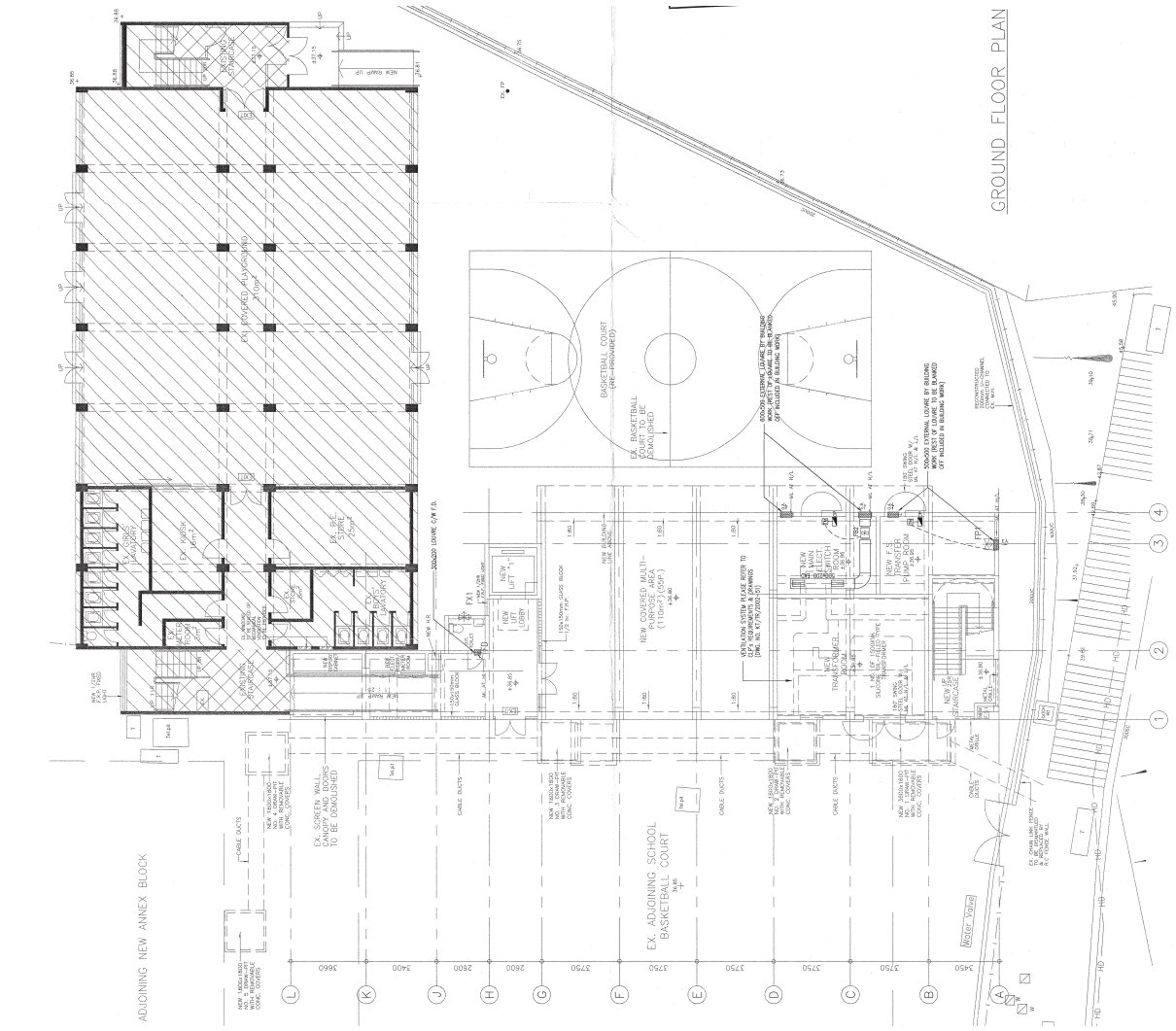


Figure 49 Distribution of schools in Hong Kong in relation to the locations of the matchbox schools.

Figure 51 Man Kiu Primary School in the 70s.

Figure 50 Classroom, playground and roof terrace.

Name of School: Man Kiu Primary School
Year Built: 1969
Location: Ngau Tau Kok, Kowloon
Financial Type: Government Aided
Area: 5640m²


GROUND FLOOR PLAN
ADJOINING NEW ANNEX BLOCK
EX. ADJOINING SCHOOL BASKETBALL COURT
BASKETBALL COURT (4HP-PROVIDED)
EX. BASKETBALL COURT TO BE DEMOLISHED
EX. COVERED PLAYGROUND
NEW COVERED MULTI-PURPOSE AREA (110m²) (GSF)
EX. SCREEN WALL CANOPY AND DOORS TO BE DEMOLISHED
NEW TRANSFORMER ROOM
NEW LIFT
NEW MAIN SWITCH ROOM
NEW E/S TRANSFER PLANT ROOM
EX. STORE
EX. CANTEEN
EX. KINDER-GARTEN
EX. TOILET
EX. STAIRCASE
NEW STAIRCASE
NEW COVERED WALKWAY
NEW 1 STOREY GUARD HOUSE
NEW 1 STOREY TOILET BLOCK
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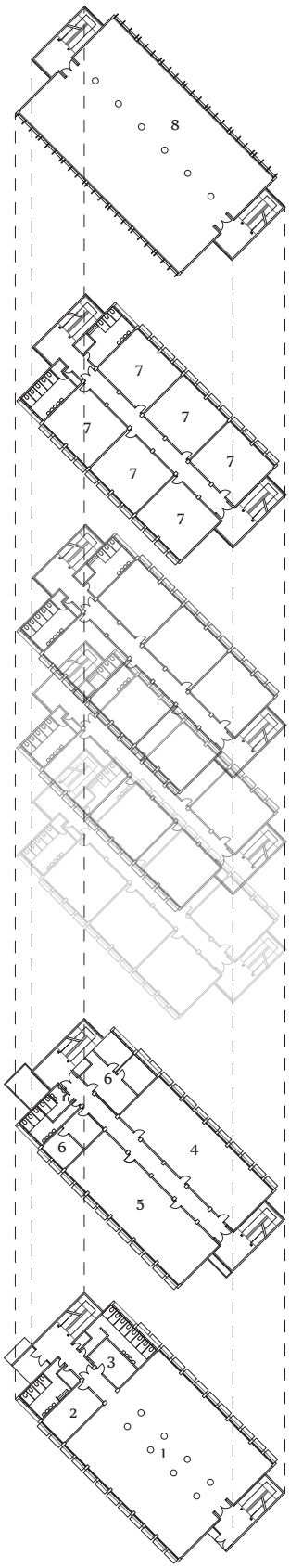


Figure 55 Stacked plans

6th Floor

8. Assembly Hall

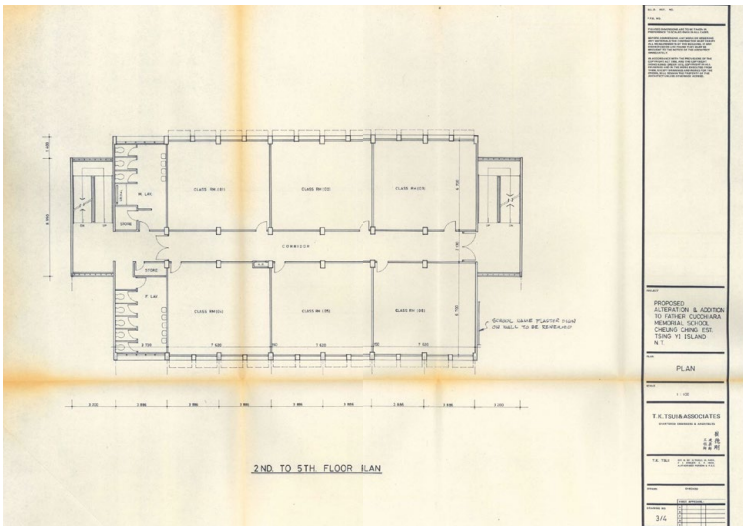


Figure 54 Typical Matchbox School 2nd-5th floor plan.

2nd-5th Floor

7. General Classrooms

The government implemented an educational reformation plan - the "Repercussion of the Seven Years Plan (1954 - 1971) - to meet the population growth challenge. The matchbox schools were mainly constructed within the time-frame of the 7 year program. The architecture of the building allows the school to be constructed repeatedly in a short period of time, and therefore "the final number of school places achieved not only met the original target number, it surpassed it by 98,000 places in total." (22 Kwong)

1st Floor

4. Staff Room
5. Music/Art Room
6. Admin and Offices

The school is based on the design of the annex school which has the +/-50m² typical classroom module. There are three classrooms flanking along each side of the double-loaded corridor and exit stairs at either end of the building. Government funded all matchbox schools in the 80s-90s to build an extension to the original building for 1-2 additional classrooms on each floor, a new elevator shaft and a stairwell. The new extensions tool over partial of the existing basketball court.

Ground Floor

1. Covered Playground
2. General Purpose Room
3. Storage

Occupied room area at the new expansion is approximately 50-60% of the building's gross floor area. The expansion provided rooms to increase student capacity, however the low building area efficiency ratio and the reduction to the outdoor play area has generated other concerns for the schools.

Similar architectural quality such as building massing, proportion, structural systems, opening treatments can be observed in all matchbox schools.

Figure 56 Exterior views

Figure 57 "Matchbox" school front elevation.

Figure 58 "Matchbox" school massing.

Figure 60 Lai King Catholic Secondary School (left)

Figure 61 Lingnan Dr. Chung Wing Kwong Memorial Secondary School. (right)

Figure 62 Aerial view of the interlocking school complex.

Name of School: Lingnan Dr. Chung Wing Kwong Memorial Secondary School and Lai King Catholic Secondary School
Year Built: 1979
Location: Kwai Chung, New Territories
Financial Type: Government Aided
Area: +/-5000m² & 6166m²

1978 government implemented the new "9-year compulsory education policy". A large amount of secondary schools were built to accommodate increasing secondary school enrollment. Interlocking school facilities are linked by a shared assembly hall building block to adapt to limited land supply.

Figure 59 Generic 3D illustration of the interlocking school.

Figure 63 Ka Ling School of The Precious Blood exterior view.

Name of School: Ka Ling School of The Precious Blood
Year Built: 1999
Location: Sham Shiu Po, Kowloon
Financial Type: Government Aided
Area: 6400 m^2

The lot size and facility of the Standard-design school have significantly improved from the previous matchbox school type. The six storey classroom building uses single-loaded exterior corridor to improve acoustical and lighting conditions along hallways. Operable window are installed on either side of the classroom to facilitate natural ventilation. External assembly hall block was included in the design as a new component to school design.

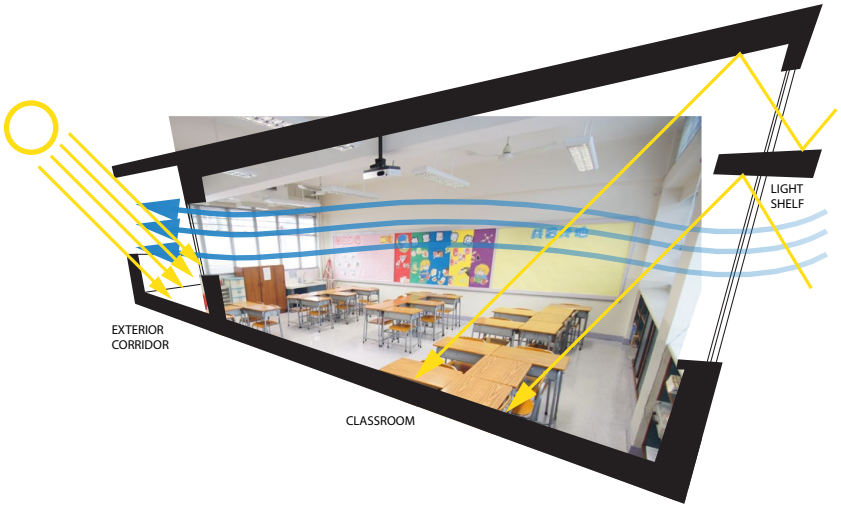


Figure 64 Conceptual sectional diagram of a "standard design" classroom.

Figure 65 Christian Alliance Toi Shan H.C. Chan Primary School

Name of School: Christian Alliance Toi Shan H. C. Chan Primary School
Year Built: 1984
Location: Sha Tin, New Territories
Financial Type: Government Aided
Area: 4000m²

The Flexi-design school type was part of the "new-town" urban planning development project lead by the government. The design included additional structural loading allowance in the structures above the covered playground (left side front building). As a strategy to allow for future expansion to be done to converted the school from a primary school to a secondary school as the demographic ages.

Figure 66 Po Leung Kuk Tin Ka Ping Millennium Primary School

Name of School: Po Leung Kuk Tin Ka Ping Millennium Primary School
Year Built: 2002
Location: Tai Po, New Territories
Financial Type: Government Aided
Area: 9370m²

L-shaped or U-shaped school buildings grouped together to form the "school viilage" where recreational facilities can be shared between the schools and the community.

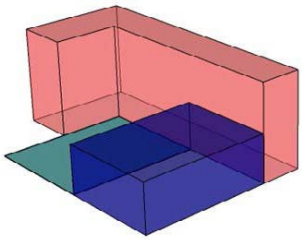


Figure 67 U-shaped

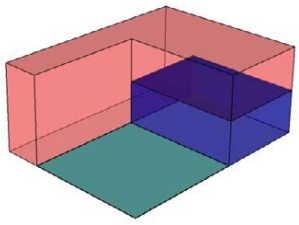


Figure 68 L-shaped

Figure 69 School Village.

Figure 70 Unlike other standardized school typology, this design is both site specific and unique in its architectural form and expression.

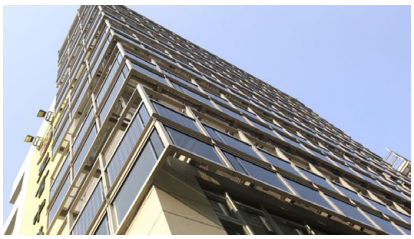
Name of School: Kowloon Tong Bishop Walsh Catholic School
Year Built: 2009
Location: Kowloon City, Kowloon
Financial Type: Government Aided

Government adopted non-standard designs for new school facilities allowing each individual school organization to participate in the design process to better customized the architecture of the school for specific school vision.

Figure 71 School courtyard

Figure 72 School playground

Stronger architectural quality can be seen on the massing and elevation composition on this custom-built school facility. Additional program space such as an upper level garden terrace creating additional outdoor spaces for students.



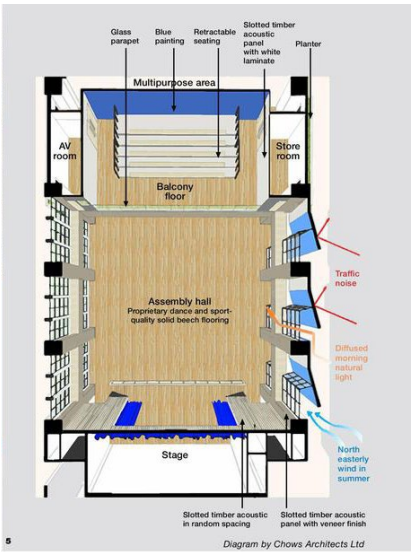


Figure 73 Exterior view of Sing Yin Secondary School

Name of School: Sing Yin Secondary School
Year Built: 2008
Location: Kwun Tong, Kowloon
Financial Type: Government Aided

The school was named the "Greenest School On Earth" by the U.S. Green Building Council in 2013. The local low-income institution's brand new campus incorporates passive environmental building strategies and harvests renewable energy to generate electricity. Featuring an oxygen-producing bamboo garden, an organic farm, and a self contained coral aquarium, the school incorporates sustainability and environmental science into the cirriculum, as well as promote sustainable living outside of school. The learning environment and the cirriculum work together to nurture real environmental leaders for the future.

Figure 74 Sing Yin Secondary School passive design systems and strategies.

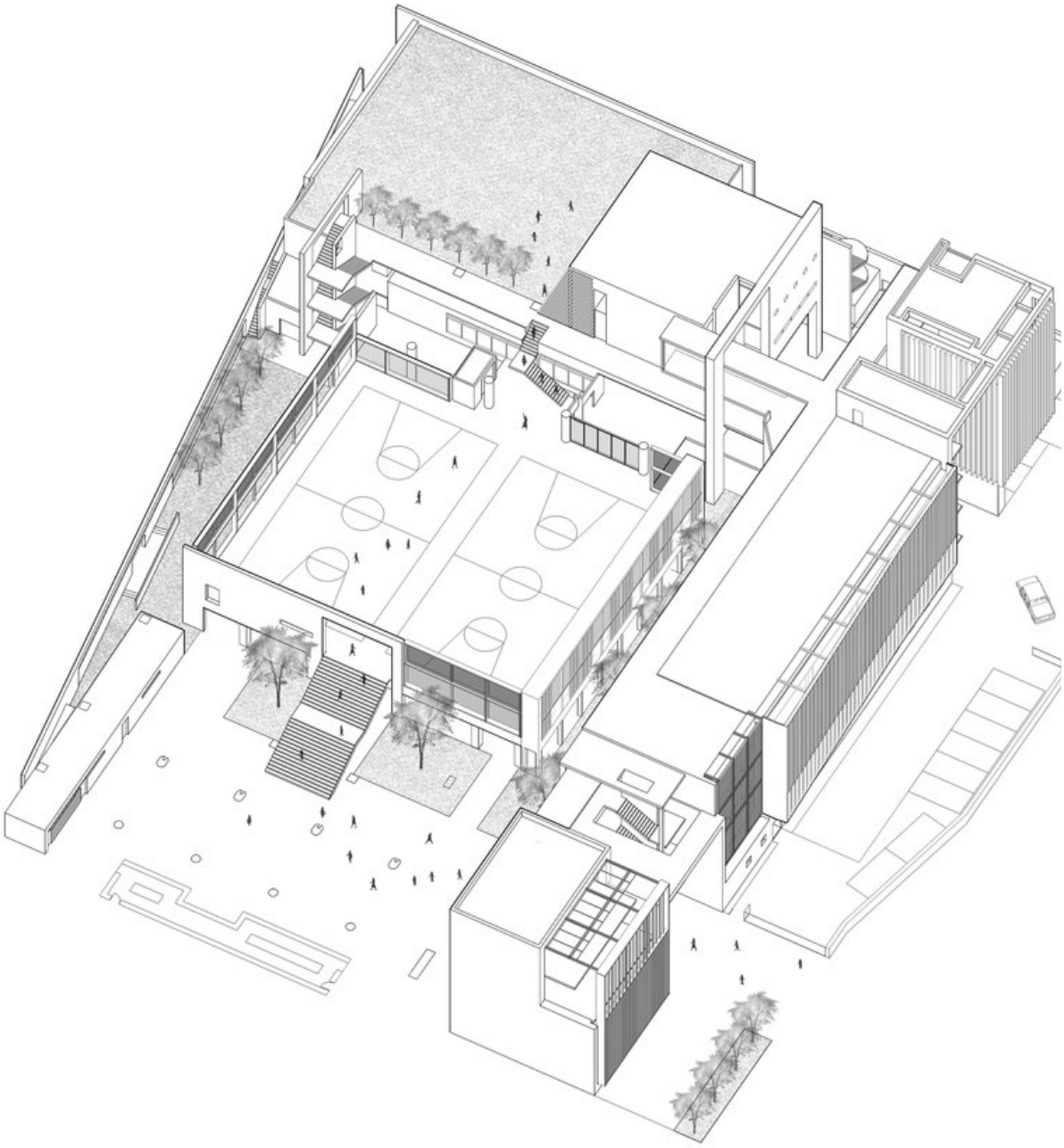


Figure 75 Kai Tak Government Primary School Axonometric drawing.

Name of School: Kai Tak Government Primary School
School Type: Innovative 21st Century School
Year Built: 2015
Location: Kowloon
Financial Type: Government
Gross Floor Area: 11150 m^2

Schools that are built in the early 21st century have embraced sustainability and renewable energy as part of their main design strategies. The choice of material, architectural forms and the organization of spaces allows the school to operate with much less energy consumption. Architecturally, emphasizing spatial transparency and inter-connectivity.

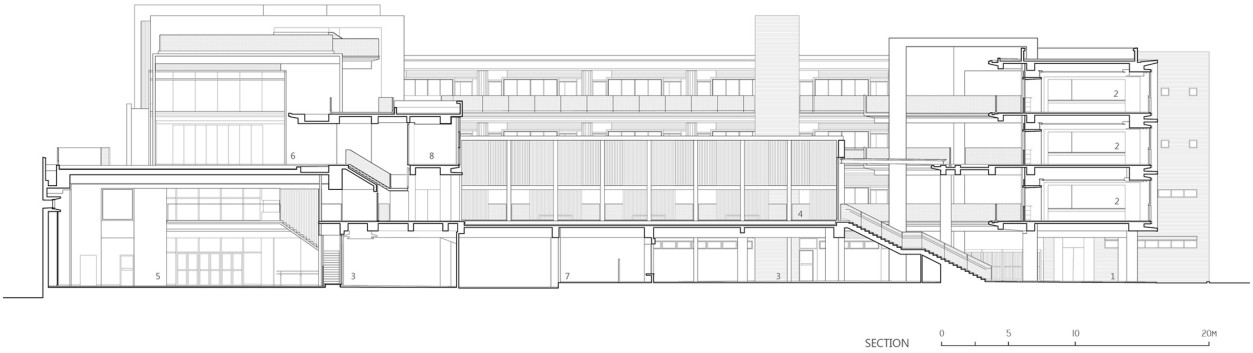


Figure 76 Kai Tak Government Primary School photographs and drawings.

Figure 77 Kai Tak Government Primary School

Figure 78 Brand new lower primary school building at the Repulse Bay Campus.

Name of School: Hong Kong International School
Year Built: 1994 (Redevelopment 2016)
Location: Repulse Bay & Tai Tam, Hong Kong Island
Financial Type: Private

International schools campus are private institutional facilities where the curriculum and the facility are less restricted by government policies and fundings. Influenced by educational approaches in North America and Europe, the learning style and environments are much more flexible compared with the typical local schools.

Figure 79 Exterior view

Figure 80 Interior view

Figure 81 Classroom with natural lighting

Figure 82 Exterior view

Figure 83 Childhood - watercolor painting.

Part 2 | Family-friendly Cities

Designing for Families with Children

Growing Up in the city

As Freeman states that "adapting to society is one of the greatest accomplishment a child will make."[1] What constitutes the childhood of a child who grows up in the city? How does intensification and densification of the urban environment make an impact on their growth?

"We simultaneously bubble-wrap young people, seeking to protect them from minor bumps, while leaving them exposed to far more existential risks"[2]

Connecting Families and the City with Transit Oriented Developments (TOD)

Children are not passive receivers of our urban environment, the way they react, explore and live in the city impact the way families live. For example, the complex schedule of a children's daily routine and the numerous destinations they need to reach on a typical day – getting to and from school and reaching desinations for after school activities in the city - can easily conflict with the parent's daily work schedule. Children often use transit in order to access these places. Proximity to safe transit options become one of the top priorities for urban families while choosing a place to live, thus Transit Oriented Developments[3] are favored amongst the urban families.

High density cities that invested in the rail system, like New York City, Hong Kong, Copenhagen and Tokyo are utilizing the rail as the main corridor for intensive densification planning. This type of TOD identified as "Adaptive

1 Freeman, Claire., and Paul J. Tranter. Children and Their Urban Environment: Changing Worlds. London; Washington, DC: Earthscan, 2011.3

2 Phineas Harper, "Why do architects dictate children's play so stringently?". Dezeen, Mar 28, 2017. Accessed Mar 29, 2017. https://www.dezeen.com/2017/03/28/phineas-harper-opinion-children-playgrounds-play-predetermined-adult-designers/

3

cities" by Urban Planning Scholar Robert Cervero[4] can be highly successful in connecting the people with the city. In a research specifically done to study the transit-oriented development (TOD) scenarios in Hong Kong, Cervero concluded that 90 percent of vehicular ctivity in the city is by public transit, "Hong Kong's experiences with the R+P programme indicates that transit value capture, first introduced in the US over a century ago, is still a viable model—not only for sustainable finance, but also sustainable urbanism."[5]

Approaching a "Complete Community"

The Inconvenient Truth About The Urban Lifestyle From a Family Perspective

The urban lifestyle has brought along efficiency, and the condensation of spatial relationship certainly benefited work-life balance for the parents. Less commuting time and more family or personal time, and yet this compression of space stripped away a layer of freedom from the children's instinct. Huizinga explained the concept of play in his book Homo Luden: A Study of the Play-Element in Culture, "they must play because their instinct drives them to it and because it serves to develop their bodily faculties and their powers of selection."[6] They absorb the environment while playing and learn by reflections through play, and ideally not in situations confined by space and time. Compressing their play space and restricting the duration of play to commit to an urban lifestyle is unfair to children. Children have an ambiguous sense of time and efficiency, the need to travel fast and often, as it is the nature of travelling in cities, can be disorienting and stressful for them. Pediatric cognitive studies show that the speed gains in the brain are directly related to the physical maturity of their bodies, "When a newborn is presented with a simple stimulus – say, a touch on the arm – it triggers a wave of electrical changes in her cerebral cortex, but this signal takes nearly three times longer to make it there than it would in an adult. Taking bodily growth in account (which shorten the conduction time for smaller – that is, younger – subjects), this translates into a nearly sixteenfold increase in the speed at which her neurons will conduct information between birth and adolescence".[7]

Figure 84 "Can we go outside?" - Do we truly understand urban living from a children's perspective.

4 Cervaro, Robert. The Transit Metropolis: A Global Inquiry. Washington, DC: Island Press, 1998. 5

5 Cervero, Robert and Jin Murakami. "Rail and Property Development in Hong Kong: Experiences and Extensions." Urban Studies 46, no. 10 (2009): 2039.

6 Huizinga, J. Homo Ludens: A study of the Play-Element in Culture. London: Redwood Burn, 1980. 8-9

7 Lise Eliot. "How Intelligence Grow in The Brain", What's Going On In There?. Bantam Books, New York. 2000. 400

The Importance of "A Place to Play"

The city must slow-down, at least at the nodes where children and youth spend most of their lives in. Denying the opportunity to play in full absorption in any way changes the way childhood matures, the architectural framework and the urban environment adults create has great powers in shaping the children's "users interface." Therefore, the built forms we create need to take children's behaviour into consideration, which creates a healthier urban lifestyle because in some sense everyone needs a bit of room to play and pause. Especially adults and elders.

"Over the last 50 years, the health and wellbeing of children has not been the cornerstone of any significant urban planning policy. However, the tide is changing. Age-friendly and child-friendly designations are of growing interest globally"[8]

Schools and Education are the Foundation of Children's Civic Life

"Putting children's education first" is not a novel concept to most parents. Parents from many different cultural backgrounds are willing to relocate their homes in search for a good education for their children. In China, the culture I am most familiar with, this practice is most referred to the Chinese Confucian philosopher Mengzi's mother's parenting attitude. She moved twice in search of a good learning environment for her son Mengzi and ended up choosing home near a local school[9]. His success is an indication that the mother's choice to relocate has an enormous impact on Mengzi's intellectual growth. Childhood experiences and memories shape the way the mind and the body develop.

8 880 Cities. "Building Better Cities with Young Children and Families - How to engage our youngest citizens and families in city building: a global scan of best practices". 880 Cities Reports. October 19, 2017. 8

9 Mencius (孟子). 《三字經 - 孟母三遷》. Accessed November 3, 2017. https://www.chiculture.net.

Figure 85 Diagrams, photos and illustrated drawings of the Triangle Children, Young People and Community Intergenerational Centre in London, UK.

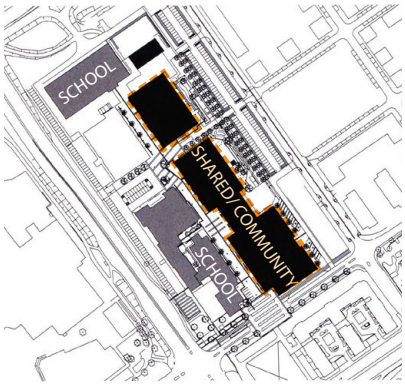


Figure 86 Site diagram.

Figure 87 Interior view of the library.

According to Freeman, the construction of childhood can be conceptualized into three key themes:

1. Childhood as protected innocence
2. Childhood as preparation for adulthood
3. Childhood as equal value to adulthood[10]

Urban cities are planned, constructed, executed maintained by the labour force, which comprises of some youth and majority of adults. It is arguable that, besides the industries that focuses on infants and children, adults can miss the needs of children or identifying what children need. At the beginning of the 1990s, researchers began to "challenge the "adult centric-ness" of urban life"[11] and research states that "It was only in the late 1990s that planners and those with an interest in urban development[12] () began to give any real attention to recognizing children as an active and formative influence on cityscapes and to explore the symbiotic relationship between city form and children's well-being."[13]

Ways To Achieve A Family-Friendly City

"There's no point making a playground until you've taken the "no ball games" signs down on the estate first."[14]

Bringing Generations Together

Inter-generational community facilities like the Mimers Hus in Sweden, the Triangle Children, Young People and Community Intergenerational Centre in London, UK and the Rexdale senior and child-care co-operating facility in Toronto, Canada are rare to find in cities. These facilities aim to provide services for people of all ages.

Mimers Hus is a community hub where the schools are combined with the community and cultural facilities. It houses a public library, a theatre and

10 Freeman, Claire., and Paul J. Tranter. Children and Their Urban Environment: Changing Worlds. London; Washington, DC: Earthscan, 2011. 9.

11 Ibid. 9

12 Boyden and with Holden 1991; Freeman, Henderson, and Kettle 1999; Woolley et al. 1999

13 Freeman, Claire, Govinda Ishwar Lingam, and Greg Burnett. 2015. "Children's Changing Urban Lives: A Comparative New Zealand–Pacific Perspective." Journal of Urban Design 20 (4): 507-525. doi:10.1080/13574809.2015.1044508. http://resolver.scholarsportal.info/resolve/13574809/v20i0004/507_cculacnzp.

14 Phineas Harper, "Why do architects dictate children's play so stringently?". Dezeen, March 28, 2017. Accessed March 29, 2017. https://www.dezeen.com/2017/03/28/phineas-harper-opinion-children-playgrounds-play-predetermined-adult-designers/.

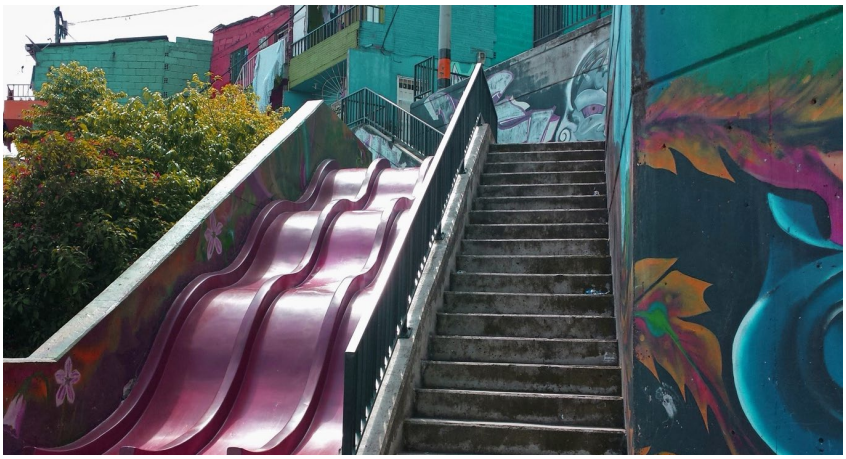


Figure 88 A triple-slide acting as a social intervention to activate the public circulation core in Medellin's Comuna 13.

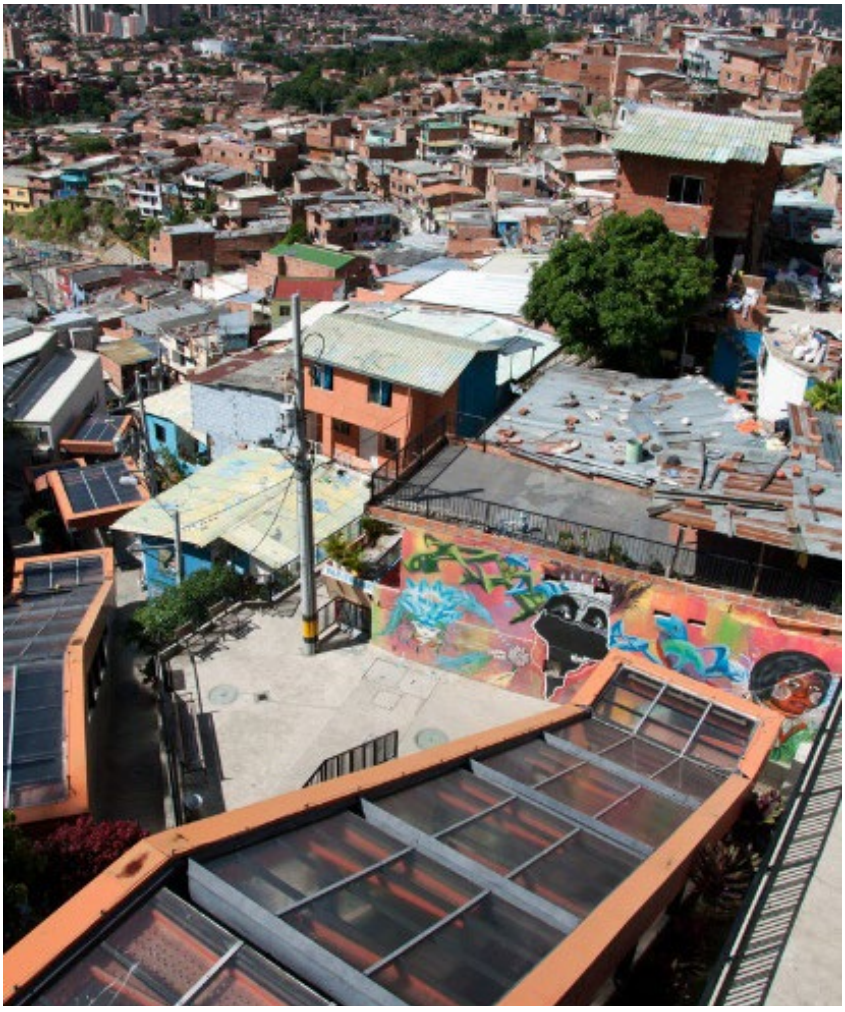


Figure 89 Overview of Medellin's Comuna 13

Figure 90 Seniors and children playing together at the City-run seniors and child-care co-operating facility in Rexdale, Toronto.

other multi-purpose rooms in the public facility block where "[S]mall children come to have their first dancing or music lessons. Senior citizens come to be introduced to the mysteries of the internet."[15]

The Triangle Children, Young People and Community Intergenerational Centre houses a day nursery, primary-aged children play centre, afterschool programs, and spaces for healthcare, training and recreational services. All users share a large common hall that overlooks the children playground as a place for people to mingle and to host larger events.

Seniors and children are placed together into one facility at the city-run seniors and child-care co-operating facility in Rexdale, Toronto. The senior's lounges on each floor have a clear view of the children's playground at the ground level courtyard.

An Open Community & User-Friendliness

While security and management still control the hours and the range of facilities that the public is allowed to use. These institutional facilities are beginning to push the boundaries of its facility to embrace the local community and citizens of different ages. Research project "Sustaining Small Expanding Towns" by an EU initiative states that buildings that are designed with the children and youth user groups in mind are more user-friendly for all and often feel safer.

Public Interventions for The Families

The public space intervention in Medellin's Comuna 13 – a set of secured escalator corridors – is further activated by a slide which a local architect had built. "As the children start arriving and discovering the playful dimension of this anonymous public space, their parents also begin to arrive, first to take a look, then to make their own social life with a salty mango ice cream in hand. If children find it good, then it is good for everyone: simple and cheap, but a high-impact intervention"[16]. The space is transformed instantly from generic circulation core to a place of activity, a point of pause.

15 Prue Chiles, "Schools and the Community. Buildings Schools - Keys Issues for Comtepmporary Design". Birkhauser, Basel. 2015. 95

16 Díaz, Rodrigo. "Medellin's Comuna 13 Shows Why All Great Public Spaces Should Be Kid-Friendly". [Todo gran espacio público debe ser espacio para el público pequeño] 06 Nov 2017. ArchDaily. (Trans. Devine, Sophie) Accessed 7 Nov 2017. https://www.archdaily.com/882554/medellins-comuna-13-shows-why-all-great-public-spaces-should-be-kid-friendly

Transformation of Schools and Classrooms

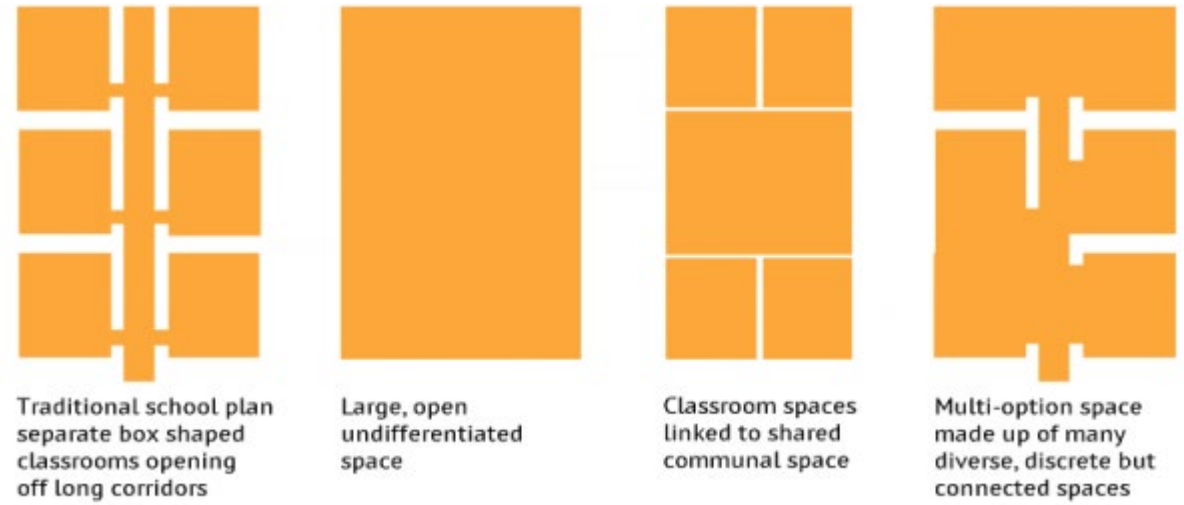


Figure 91 Types of school spatial typologies illustrated by Mary Featherstone, interior designer and a scholar of child centered learning environments.

THEN...

Figure 92 Photos of a traditional classroom and students where schools were deisgned to resemble a space for mass production, a space for common religious gathering or a place of domestic settings.

Part 3 |
The School Typology

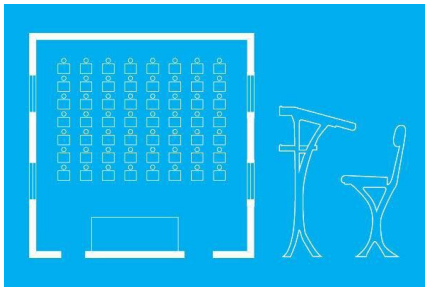


Figure 93 "[A] school was (and is) reduced to its barest recognizable elements: a single place of meeting, a teacher, a means of instruction, a means of inscription, an organized form of seating (usually arranged in lines), a shared purpose and, of course, children."[3]

The Changing Learning Environment

Comparing Now and Then

Many older schools worldwide are confined in forms of school building and classrooms that are based on design theories from past educational methods. "We also developed a factory model of schooling in which groups of students progress lockstep along a predetermined path, all learning the same thing at the same time in the same way. Factories are not about individualization; they are about standardization."[1]

The role of education is changing and the training required for students today has changed. In the book Creating cultures of thinking, by Ron Ritchhart, Ritchhart stresses the fact that the contemporary education calls for the reformation in the educational curriculum, the attitude and nonetheless, the environment that has the potential to shape the learning cultures in any given school. Based on scientific research results, Ritchhart believes that to transform education, we must first convert the cultures of inquiring, questioning and thinking to become a dynamic and visible process. The architectural environment is the boundary and the foundation for such learning culture.

[T]here is a possibility that the school as we have known it, established in the nineteenth and the twentieth centuries, with a subject-based curriculum, delivered didactically in traditional classrooms, is disappearing, as learning anything, anywhere and at any time is becoming potentially achievable."[2]

1 Ritchhart, Ron. Creating Cultures of Thinking : The 8 Forces we must Master to Truly Transform our Schools (San Francisco, CA: Jossey-Bass, a Wiley brand, 2015). 229.
2 Catherine Burke and Ian Grosvenor, School. London: Reaktion Books Ltd., 2008, 21.

NOW...

Edible Education

An edible education places the child at the center of their learning. Through holistic, inclusive, culturally-responsive pedagogy and practices, students develop skills, knowledge and behaviors that enrich their academic and non-academic lives, bolster their individual, community, and global identities, and cultivate meaningful engagement with their own health, the health of their communities, and the health of the environment. A child-centered theory and practice, edible education engages every context within a child's learning, from the traditional classroom to the kitchen and garden classrooms, the lunchroom, as well as their home and broader communities.

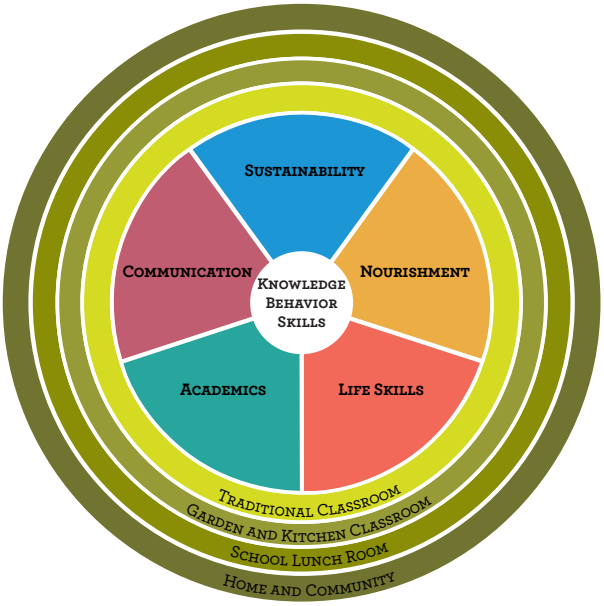


Figure 94 Edible Education

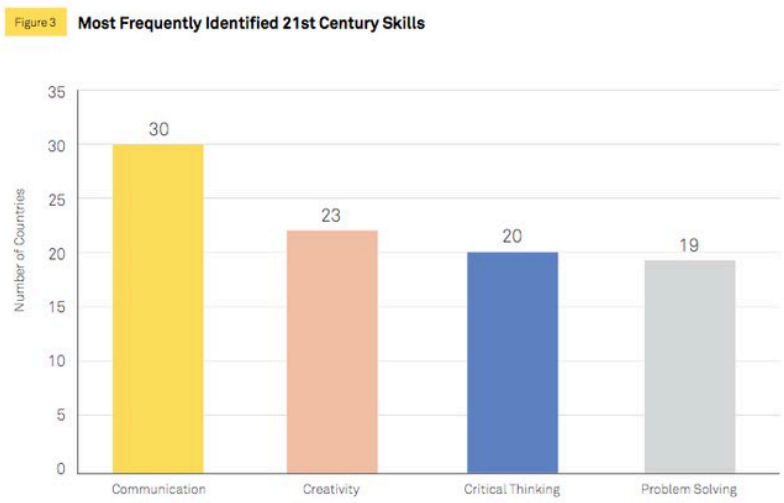


Figure 95 Collage of the focuses, methods, and directions of the 21st century education.

Key words: Communication, innovation, critical thinking, collaboration, integration, problem solving, technology, sustainability, teamwork, inclusiveness, experiment, flexibility, dynamic, community, active, healthy and etc.

Figure 96 Examples spaces and qualities commonly found in the 21st century school typology.

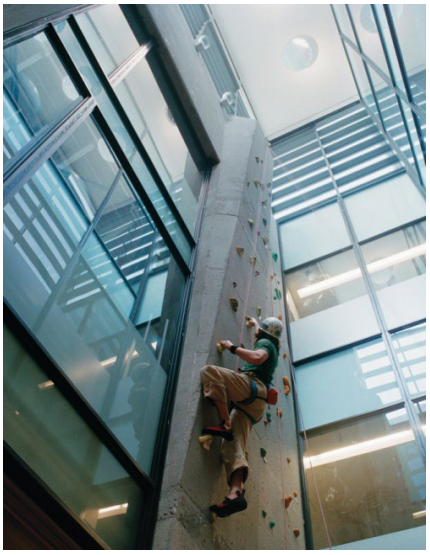


Figure 97 Indoor climbing wall

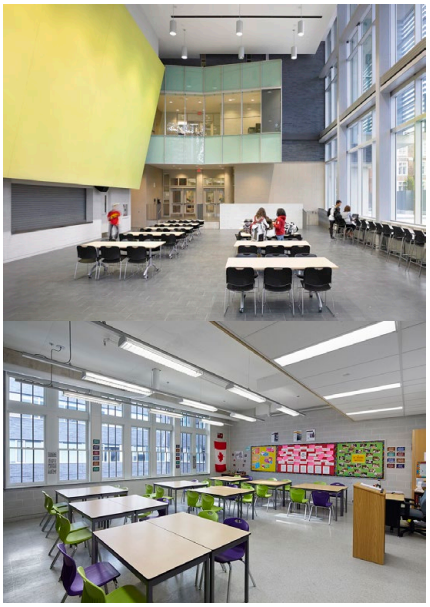


Figure 98 Interior views

The Emerging School Typology

Contemporary education has become much more progressive compared to the traditional school. With the incorporation of new technology, the pedagogical practice is now leaning towards training children's soft-skills, so that they have the ability and characteristics to sustain a lifelong learning process in the future. A new kind of pedagogical dynamics is emerging, and the architecture of the learning environment has to be reinvented to match the changing educational methods.

At the beginning of the 21st century, more and more emerging new school designs attempt to challenge existing school architecture. The number of school buildings examining architectural quality suitable for the evolving pedagogical visions has increased significantly in the past two decades.

Community Involvement

At the same time, schools are widening their role in the society to allow educators, children, parents and even the community to engage in a broad range of educational and skills developmental activities that were not part of the school's operation before the end of the 20th century. The expectations from the community are gradually slipping into the design agenda. Therefore, architects, urban planners and educators are working together to increase the efficiency of all kinds of school spaces. Incorporating new functional spaces into the school program, and strengthening the position of schools in the community.

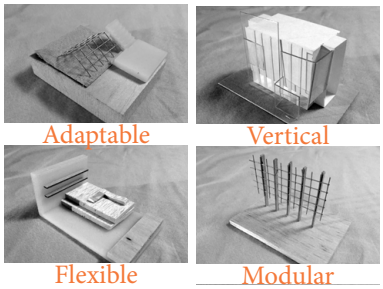
Education and Technology

With the innovation of the Internet, the vast digital infrastructure and technology, the school's physical form and purpose have become more abstract and obscure. Schools in the 21st century can contain multiple functions; it seeks to not only be the institution for educating children but also a museum, a library, a playground, a garden and a home. The blurring functional boundaries urge school designs to be more adaptable and flexible. Examples of 21st-century schools demonstrate a typological quality that is no longer govern solely by statutory standards; the new school typology obliges by design principals such as dynamic oriented spatial arrangements, inviting materiality, sustainable strategies, and technology-driven technicality.

Part 4 | Design Guideline

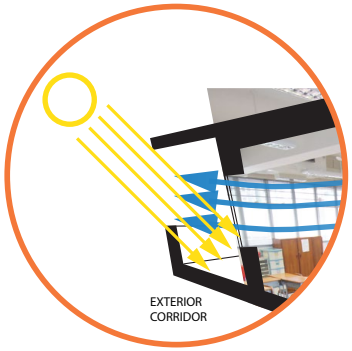
Case Studies and Sources

This section outlines the requirements for the design of the new school development. Each topic is explained by the selected case studies. The guideline addresses the anticipated quality of the building, including the exterior and the interior spaces. It delineates the design priorities and function as a tool for the structuring of the final design.



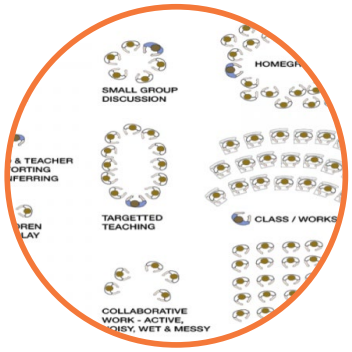
I. Basic Needs

A Healthy Environment – Air Quality, Natural Light and Quality Acoustics



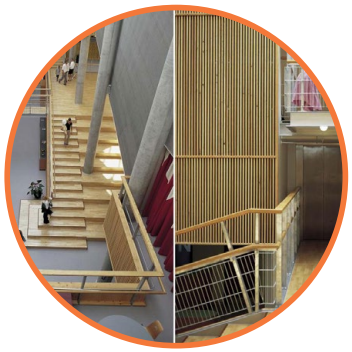
II. Flexibility and Learning Dynamics

Combining Multiple Types of Learning Environments



III. Adaptability - Forms & Spatial Configurations

Multiple uses and usage at different scales



III. The Mixed-use Vertical School Typology

High-rise Schools- Maximizing gross floor area ratio.

IV. Urban Planning, Zoning Regulations, and The Financing Model

Community Integration and Land Optimization

V. Materiality, Sustainability and Modular Construction Method

Sense of identity, domesticity, comfort and prefabricated components

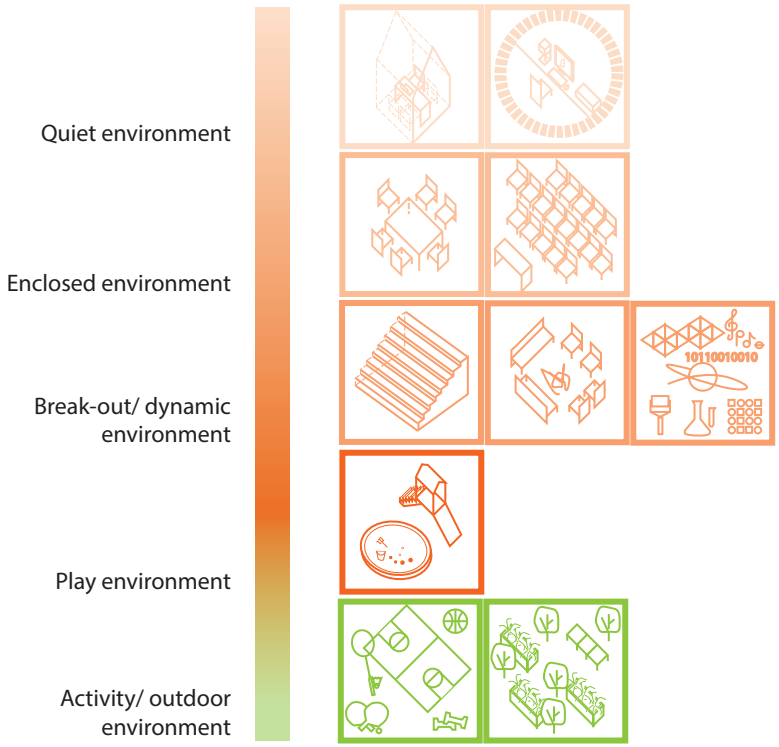


Figure 99 Diagram of learning modes and acoustics environment overlay.

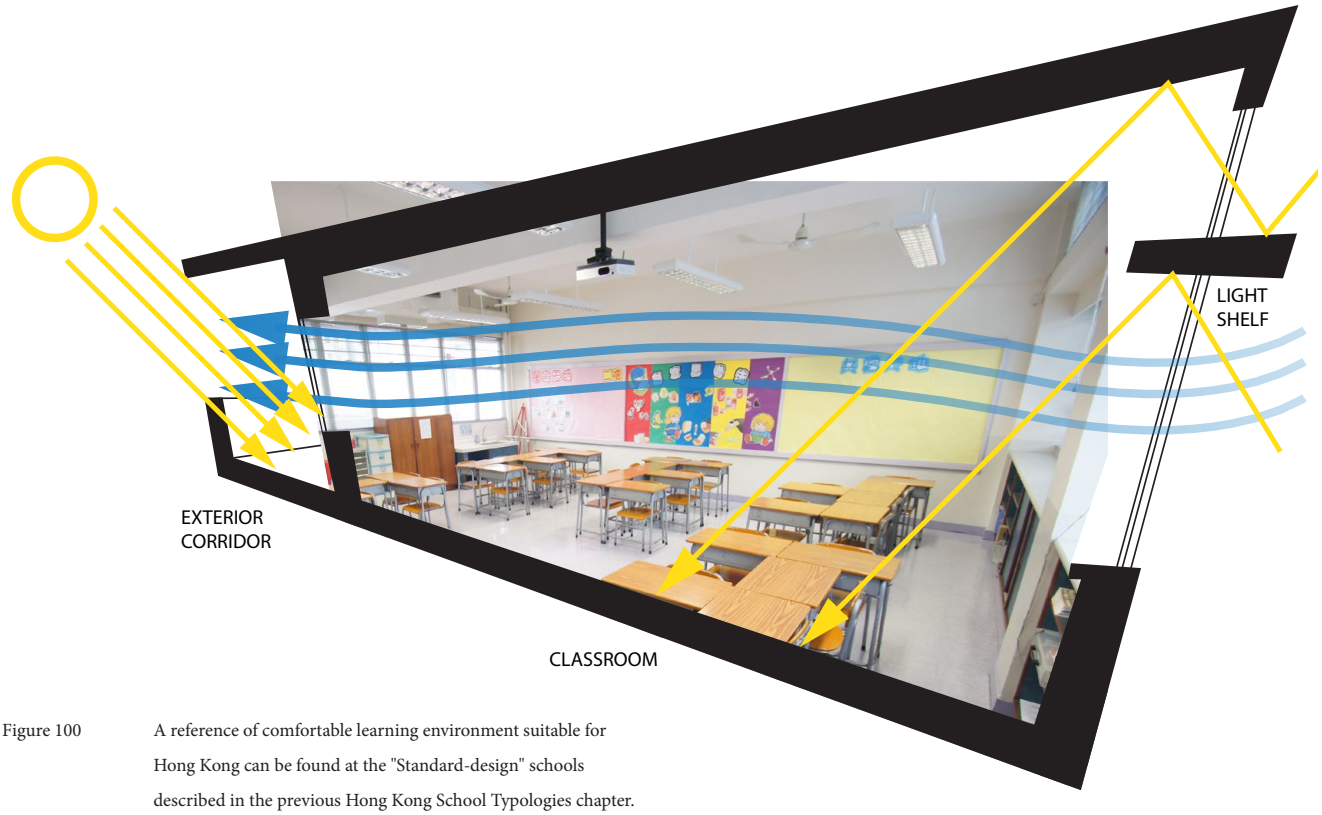


Figure 100 A reference of comfortable learning environment suitable for Hong Kong can be found at the "Standard-design" schools described in the previous Hong Kong School Typologies chapter.

I. Basic Needs

Figure 101 Illustrated - *HIERARCHY OF NEEDS* by Abrahna Maslow.

Basic needs and physiological Development

Abrahna Maslow (1908-1970) was one of the leaders in the research and study on humanistic psychology. His theory was formulated based on a 5-stages or human growth – The Hierarchy of Needs (see figure 98). From the bottom and most basic to the most acute needs at the top, the 5 stages are physiological needs, safety and security, sense of belonging, self-esteem and lastly, self-actualization. The theory helps define the basic need for all human, therefore, are important considerations for all learning environments for children.[1]

A Healthy Environment – Air Quality, Natural Light and Quality Acoustics

Providing a comfortable learning environment is crucial to the health and learning ability of children in schools. First, children are physically more vulnerable to risks and hazards in the environment. First because children's body and organs are still developing, toxins in the air, water or food they consume pose more harm to the children's bodies then to adults. Prioritizing good indoor air quality, natural light and quality acoustics in the environment will increase children's ability to stay focus and optimize learning.[2]

1 Mau, Bruce, Cannon Design, VS Furniture. "The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning." Abrams. New York, New York. 2010. 34.
2 Ibid. 26.

Figure 102 Child playing as she learns and develop her physical motor skills and coordinations.

Spaces for Creativity and Innovation

Secondly, the school building is the "third teacher"[3], it is the platform to perform the newest pedagogical methods, Sir Ken Robinson, a leader in the research and practice of creativity, human potential and innovation in the organizations, states that the education system is searching for new pedagogical practices for the future economy where the hierarchy and structure of subjects in the current curriculum has to be refined[4]. The school as a habitat for learning has a role in facilitating the change, "[S]o you want flexible spaces where people can group and re-group where you're not stuck in one configuration with teachers at the front."[5] The basic architectural form and the structural system, provides the foundation for a flexible learning environment that enables teachers and students to learn in an innovative and creative setting.

Consider Movements: Safety In and Out

Lastly, reducing risk and providing a safe environment is key to a comfortable learning environment. Children's learning ability improves when movements and physical mobility is permitted. Where there is movement, there will be danger. Safety and accessibility should be one of the top priorities within the classroom and outside of the classroom. Investing in dynamic furniture, safe play structure and dynamic outdoor landscaping allows children to discover the endless opportunities for play and exploration.[6]

Watching a child makes it obvious that the development of his mind comes through his movement. – Maria Montessori.

Figure 103 Stacking blocks

3 Ibid. 1-11.
4 Ibid. 58.
5 Ibid. 58.
6 Ibid. 97.

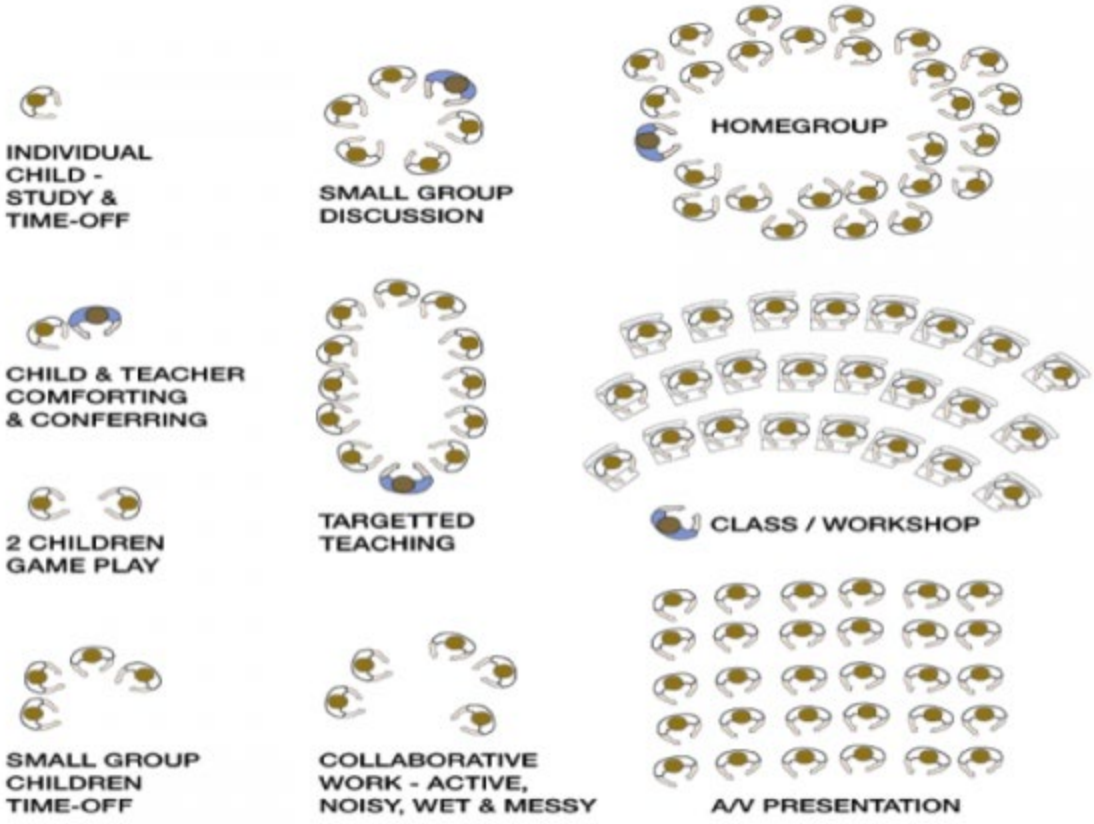
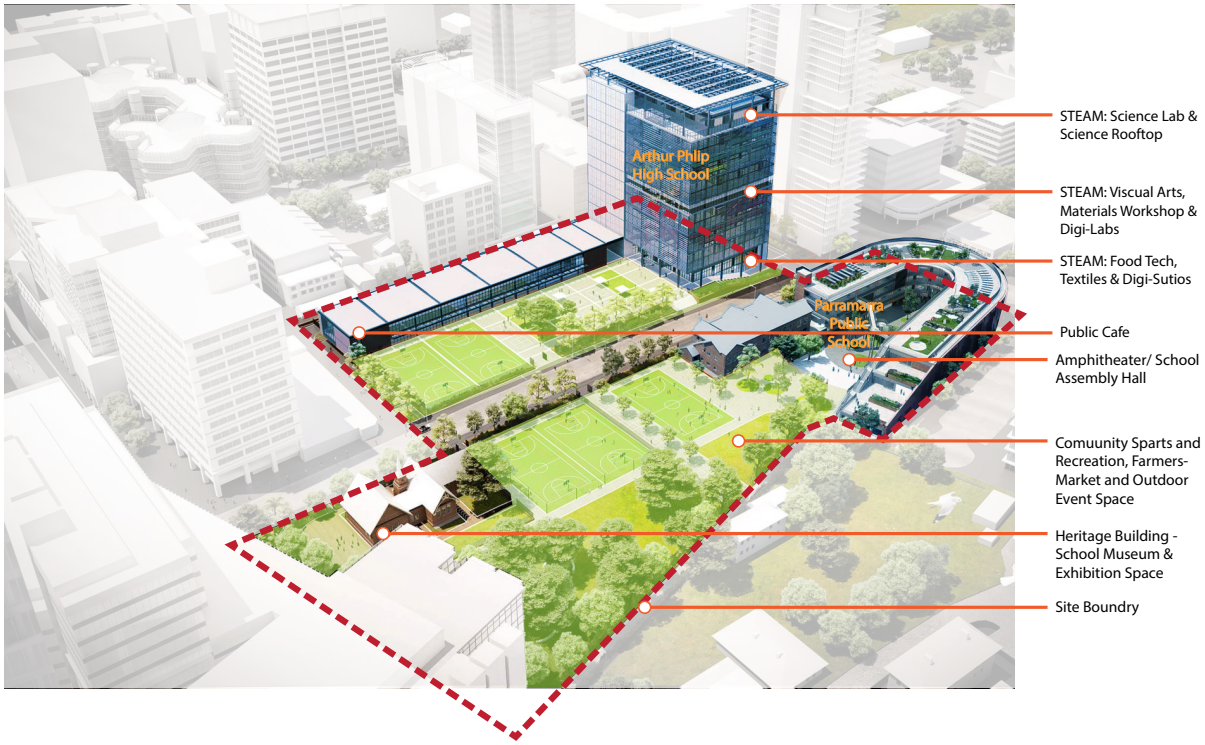


Figure 104 Learning modes

II. Flexibility and Learning Dynamics

Combining Multiple Types of Learning Environments

Diverse learning environment provides the flexibility pedagogical trends required, a combination of various learning environments is located in each school community. The possibility to involve students in enclosed cells, open and collaborative area, outdoor spaces and play spaces gives them the freedom to engage their imaginations and learn.



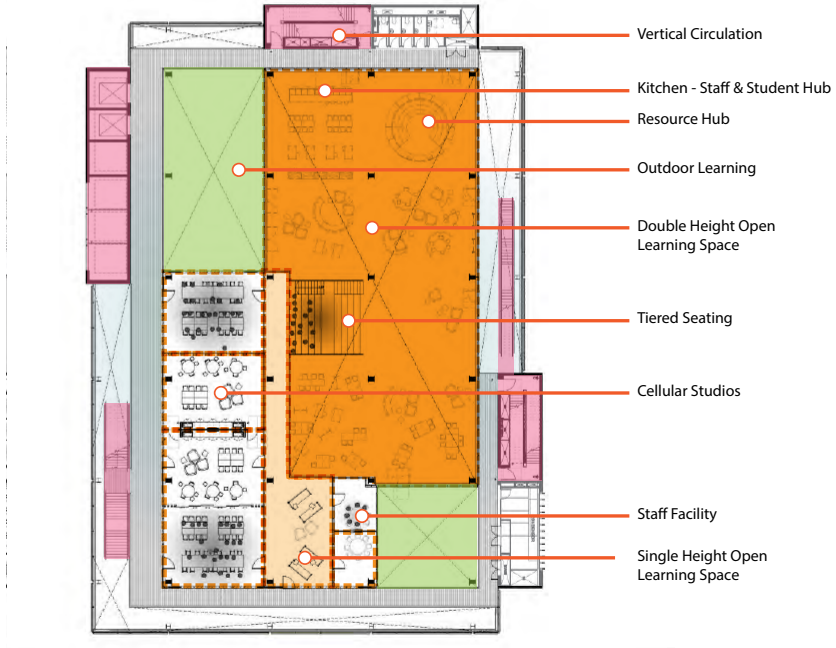


Figure 105 Karissa Rosenfield. "Grimshaw and BVN to Design Parramatta's First High-Rise Public School".

Precedent Summary:

Arthur Philip High School,
Parramatta Public School | Sydney, Australia
Grimshaw Architects & BVN

Gross Floor Area:
Primary School - 9500m²
Secondary School - 33000m²

No. of Students:
PS - 1000
HS - 2000

Year of Completion:
2019

- 17-storey high school, 4 storey primary school on a 30000m² site at the urban core of Sydney
- Flexible spatial organization with open learning, cellular learning and outdoor learning spaces on each double-storey "Home-base" learning community.
- Multiple internal vertical transport routes for circulation efficiency.
- A commercial kitchen, digital studio, textile studio, science lab, maker's workshop is included on the STEAM levels at the school.
- Large outdoor public facilities on street level.

Arthur Philip High School is the first high-rise school in Australia. The building takes on a new vertical school model as a prototype for future urban school developments. The 17-storey high school building is broken down into double-story smaller communities that are refereed as "Home-base." Each Home-base is equipped with three types of learning spaces:

1. Open Learning

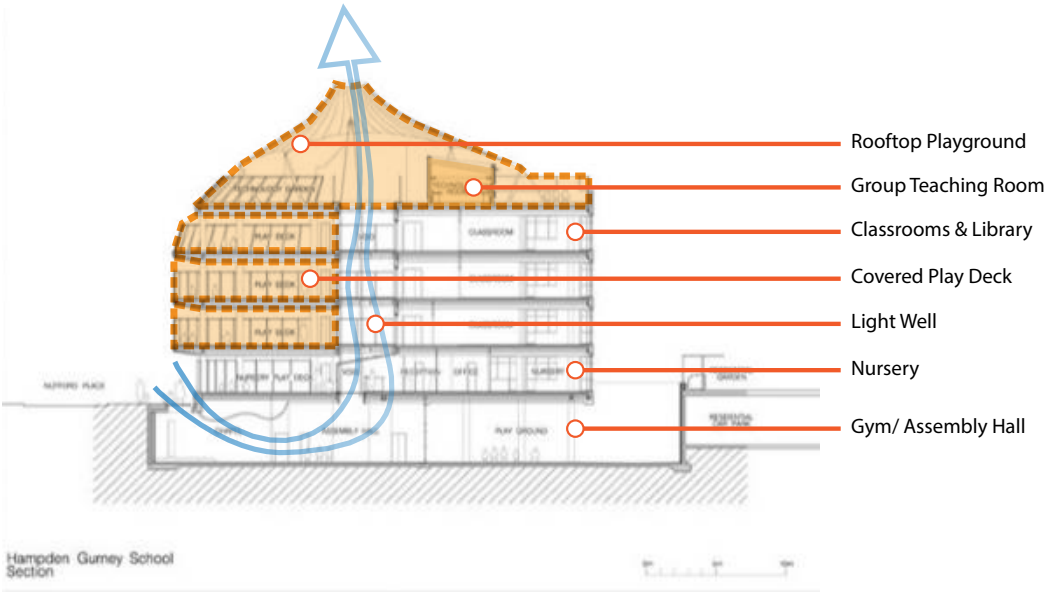
Majority of the floor space on the upper level is opened up to allow for a 19.2m x 38.4m double height open learning commons. The space is highly flexible to accommodate dynamic collaborative learning activities. Functionally, the sized and shaped of the space is maximized for passive daylighting and natural ventilation.

2. Cellular Learning

The Cellular spaces are workshops and reading rooms, placed around the learning commons as space for lectures, presentations and resource storage.

3. Outdoor Learning

Outdoor learning zones are located on the perimeter of the floor plate; it functions as main circulation corridor as well as a weather-protected platform for any outdoor related learning activities. The total outdoor learning area included at both schools plus the ground floor public space on the site is 1000m2 over the site area.



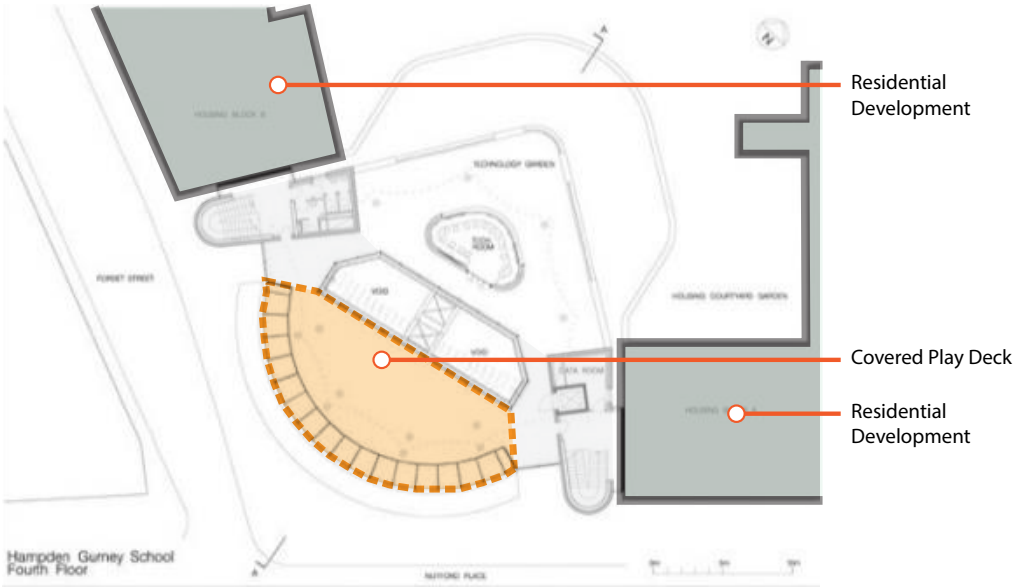


Figure 106 Hampden Gurney School

Figure 107 Hampden Gurney School interior and exterior views.

4. Play Spaces

Outdoor play and physical activity area can be located at multiple levels other than the ground floor to ensure landscaped open spaces, and playground area requirements are met.

Precedent Summary:

Hampden Gurney School | London,UK
Building Design Partnership

Gross Floor Area:
4 400 m²

No. of Students:
240

Year of Completion:
2002

- Replace a 1950s school with modern facilities for 240 pupils aged 3.5-11 yrs and a day-nursery.
- Incorporated a residential development on the former playground area.
- Maintain the statutory amount of play space by including outdoor terrace on each floor.

The Hampden Gurney School in London is an example of a multi-level urban school. The urban school had to leverage financing by selling out a portion of its already tight site to a residential development. The 52-unit apartment building took up the majority of the playground of the existing school site, the design team lead by Building Design Partnership established an "inter-related learning and play" vertical school strategy to achieve the statutory amount of play-area within the 6-storey school.

Highlighting the importance of "play" in schools, the classrooms on each level connect to a weather protected outdoor play terrace by a bridge spanning across a light well. The light well brings daylight deep into the lower levels of the school, and it is designed to facilitate natural ventilation through stack effect. The school's new building can reach more usable teaching and playing area while taking up less than 1/3 of the original site area.

"Very good use of a tight site, and a creative approach to financing. Excellent outdoor play spaces at all levels."

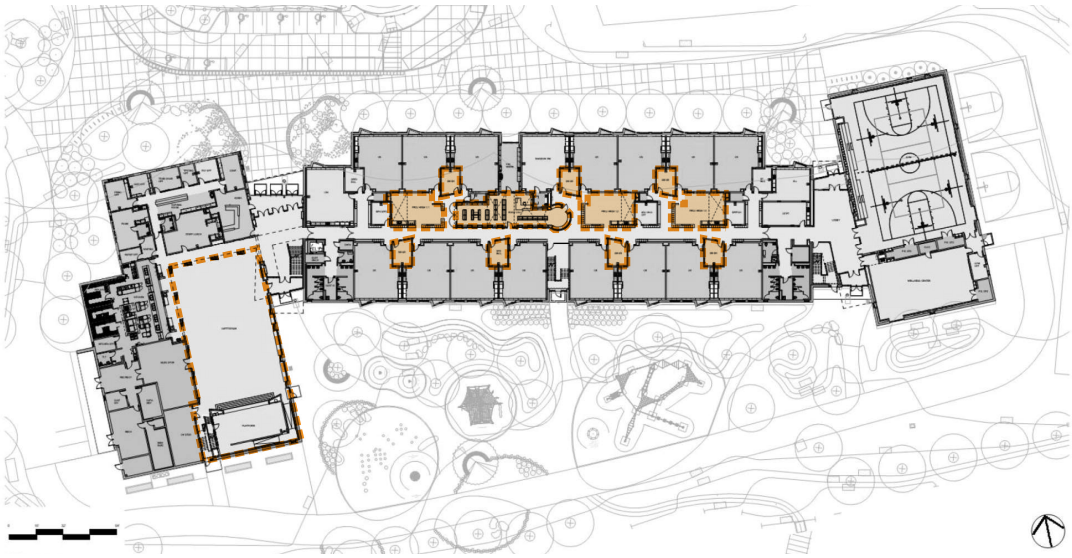


Figure 108 Diagrams highlighting all learning commons.

Figure 109 Sectional presepctive

Figure 110 Interior view

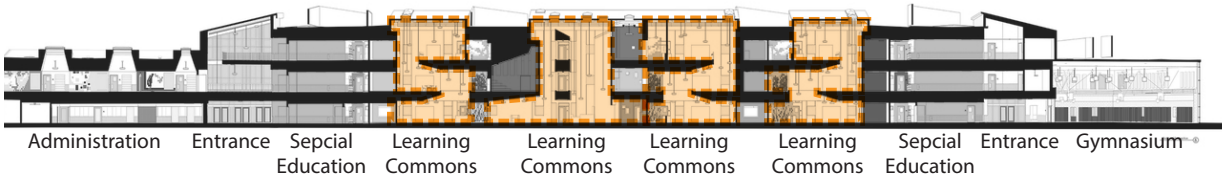


Figure 111 Long Section

(Figure 105) Typical floor plan highlighting the common learning zones. (Figure 106) Sectional diagram of the a typical learning common, (Figure 107) Student group activity at an open learning common equipped for messy hands-on work. (Figure 108) Section through the entire school hight-lighting all of its learning commons.

Figure 112 Learning Commons

Precedent Summary:

Woodland Elementary School | Milford, USA
HMFH Architects
Gross Floor Area:
12310 m²

No. of Students:
985

Year of Completion:
2016

- Breaking down school into smaller learning communities
- Learning commons as alternate classrooms.
- Pedagogical approach: differentiated instructions
- Technology integration

5. Learning Commons

Many schools in the cities are anticipated to accommodate a larger group of student population, ranging from 300 to 1000 students per school. The organization of the school is broken down into smaller student communities to create a more intimate and transparent environment that helps children and youth identify their individual goals. Resources and staff distribution can also be better managed within each community.

The pedagogy of the school depends heavily on differentiated instructions and Response to Intervention (RIT) approaches. This kind of teaching methodology makes use of alternate teaching approaches and individualized instructions. Many of the lessons are done through "directed learning, small group activities, skill building, individualized instruction, and project-based learning as well as other techniques to ensure that the needs of each student are addressed."

In response to the educational program, the design of the new school for Woodland Elementary School features small-scale learning communities that branches off a series of larger shared spaces. Groups of small classrooms are joined by a learning common just outside of the classroom - these learning commons consists of a series of programmatic features, such as the amphitheater, circular seating, built-in sinks for messy hands-on projects.

The architectural arrangement of these learning commons pairing with the classrooms allows the educators to teach with flexibility, where they can easily move outside of the classroom for activities and allow students to explore and learn about alternate methods that suit their interests. The diverse settings provide a wide range of spatial resources that generic classroom lacks in the past. By adding steps to the room, carefully articulating the shape of the room, reconsidering plumbing and mechanical requirements for each room and by bringing in natural light, the architects of Woodland Elementary School were able to transform the typical learning environment into a much more dynamic school that supports a wide range of subjects and activities.

"The new school – which mimics many new school buildings – is "really set up for 21st-century learning," McIntyre (Principal) said."

Figure 113 View of the atrium staircase at a middle level landing.

Figure 114 Students studying in an independent learning balcony.

Figure 115 Three types of spatial arrangements: open plan, individualized pods and, activity spatial features.

Figure 116 (Left) Ground floor plan and (right) first floor plan, highlighted area indicated location and extend of the atrium staircase.

III. Adaptability - Forms & Spatial Configurations

Precedent Summary:

Hellerup School | Gentofte, Denmark
Arkitema Architects

Gross Floor Area:
N/A

No. of Students:
640

Year of Completion:
2002

- A new school designed for an experimental approach to teaching in open environments.
- Central atrium staricase as the schools' diversified open learning and assembly space.
- Individual and small groups study balconies makes space for independent learning.

Every room/space in the building should be designed to anticipate multiple uses and at different scale. Educational curriculum changes from time to time, the building must be able to adapt to the different anticipated educational activities in the current time and in the future without the need for major alterations.

1. Central Atrium Staircase

The space is the main assembly hall for the school. "A great variety of activities happen on the stairs: movement, sitting, education, teamwork, presentation, and recreation - the stairs are seating for film screening." The staircase creates opportunities for diversified learning activities and informal discussions for new modes of learning suitable for contemporary schools.

2. Small Groups and Independent Learning Pods

Small balconies are places at unexpected places for students to sit and study or collaborate in small groups.

Figure 117 Architectural elements and details used to breakdown large open spaces.

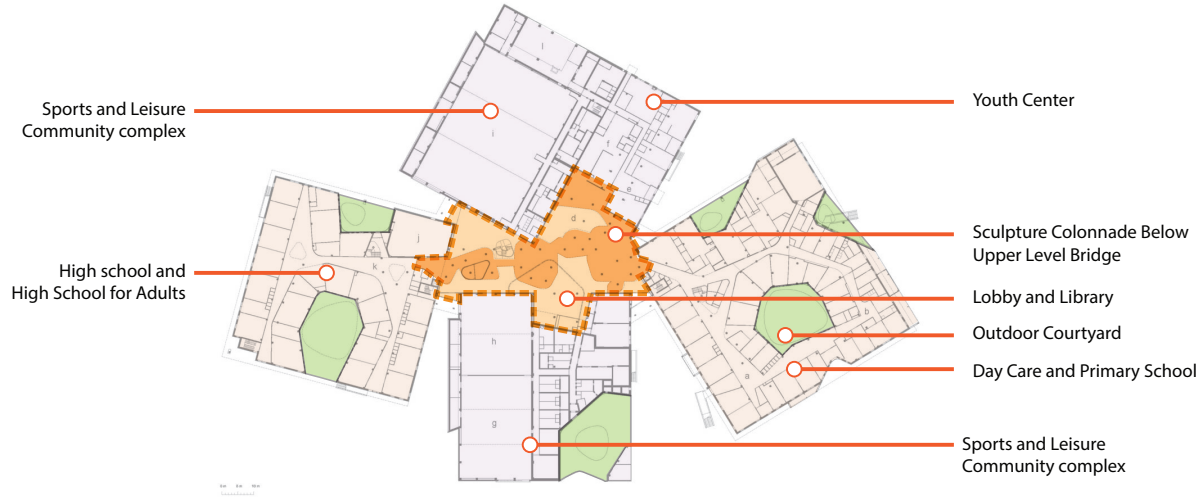


Figure 119 Illustrated floor plan

Figure 118 The smaller components used to break down the scale of the building in the outdoor spaces and on the facade makes the massive building more approachable.

Precedent Summary:

Kastelli School and Community Centre | Oulu, Finland
Lahdelma & Mahlamäki Architects

Gross Floor Area:
24650m^2

No. of Students:
1500

Year of Completion:
2014

- PPP new development
- Mixed programs, a place for learning, education, sports and culture.
- School villages are paired with open concept "cultural trails" to introduce a sense of community.
- Large circulation spaces as thresholds.
- Scale of building parts are adjusted to suit students of different ages.

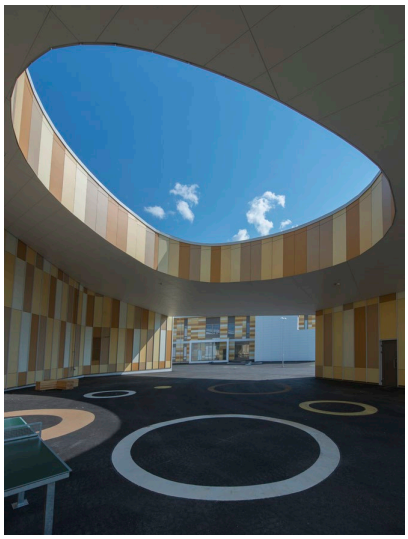


Figure 120 Sculptural skylight and colorful wall treatment framing a playground space for younger children to address the issue of scale.

3. Appropriate Spatial Size and Scale

Appropriate furniture and fixture sizing are crucial to the health and comfort of the users. The scale of spaces within the school is carefully considered to address appropriate visibility and intimacy.

> "The Kastelli community centre is a ground-breaking facility both nationally and internationally: the building's architecture serves its operations and functionally the building represents the leading edge of spatial thinking to promote teaching and learning. The efficiency of the space is an example of what can be achieved through combining functions and using innovative design."
>
> - Jouko Leskinen, City of Oulu Facilities Management Centre[1]

The Kastelli school and community centre is an educational and communal facility that makes learning collaboratively possible. The complex includes a day-care centre, a primary school, a secondary school, a school for adults, an adult educational centre, a library and a youth centre. The community centre component houses extensive sports and leisure activity spaces; the largest space can accommodate community events for up to 800 people. All cultural and sports facilities within the building can be shared between users of the schools and other community groups. The combination of programs and overlapping programmatic arrangement in the complex allows the spaces to be used with higher space efficiency.

Breaking Down Large Open Spaces for Children

Scale and the use of bright colours plays an important role in the micro spaces within the complex. Particular attention is given to down-playing the vastness of the building. Breaking down large open spaces with sculptural structural elements, incorporating children-friendly details and fixtures in the different parts of the building are some of the techniques used to break down the scale of the structure. The outdoor landscaping is also further divided into smaller play yard pockets with appropriate equipment and fixtures suitable for a variety of age groups. Bright and playful colours are used to identify the functions of the spaces and acts as a way-finding tool.

Spatial Flexibility

The learning environment was designed collaboratively with pedagogical experts, where design innovations are supported by high-level research. Flexibility and adaptability are key architectural design strategies that make putting a large selection of programs together possible. A wide-open concept pathway and a large double height lobby/ canteen form a space that binds the children's school and the youth & adult's school. It provides sufficient circulation buffer and a common place to gather.

1 Timo Salmi. "Kastelli community centre". City of Oulu. Oulu. 2

Figure 121 Ryerson University's new mixed-used development in downtown Toronto, Daphne Cockwell Health Sciences Complex by Perkins + Will Canada, is a interdisciplinary academic hub for living and learning. An 8-storey academic podium is topped by an 18-storey student residential tower.

III. The Mixed-use Vertical School Typology

1. High-rise Mixed-use Schools

To further optimize land value – high-rise schools are emerging in the cities. The vertical school typology maximizes gross floor area ratio and allowing multiple uses within the same development. Where providing alternate vertical transportation options like the escalators, additional convenient staircases to accommodate rush hour traffic is crucial to its daily function.

Figure 122 Street view of the Arthur Philip High School.

Figure 123 Site plan of the development highlighting the majority of ground open spaces dedicated to public activities and use.

Precedent Summary

Arthur Philip High School,
Parramatta Public School | Sydney, Australia
Grimshaw Architects & BVN

Gross Floor Area:
Primary School - 9500m²
Secondary School - 33000m²

No. of Students:
PS - 1000
HS - 2000

Year of Completion:
2019

- 17-storey high school, 4 storey primary school on a 30000m² site at the urban core of sydney
- Flexible spatial organization with open learning, cellular learning and outdoor learning spaces on each double-storey "Home-base" learning community.
- Multiple internal vertical transport routes for circulation efficiency.
- A commercial kitchen, digital studio, textile studio, science lab, maker's workshop is included on the STEAM levels at the school.
- Large outdoor public facilities at street level.

2. Vertical Transportation Efficiency

Provide multiple protected and private circulation routes for the school to increase circulation efficiency. For the students and their families living within the development, direct access from the residential building to the school should be provided.

Minimizing Travel

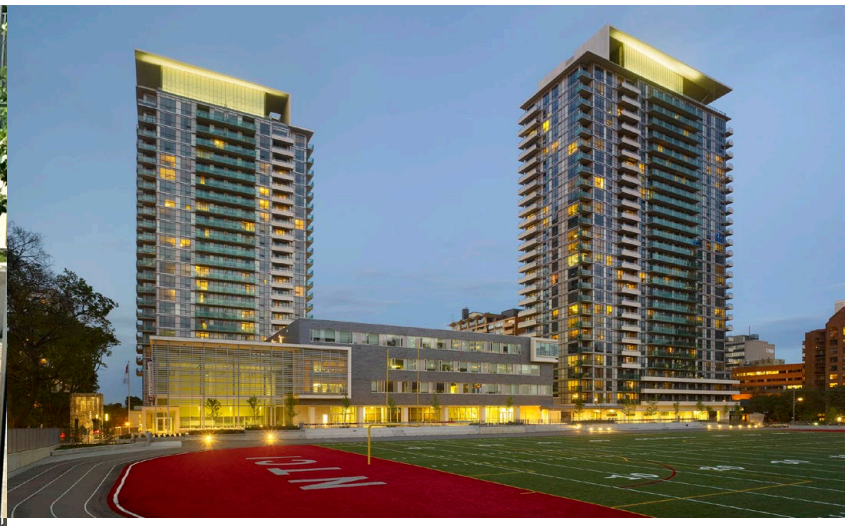
Primary school is shaped around a central courtyard. Spacious outdoor activity spaces are directly accessible to all classrooms. Primary students' activity can be minimized within their floor.

Accommodating Peak-hours Traffic

The architect worked with the school's management to develop an optimal cost and performance balanced strategy for vertical transportation. A staggered student schedule was developed to avoid rush-hour traffic.

Encouraged Alternate Vertical Opportunities

Generously sized alternate staircases and exit stairs are located at convenient locations with access to direct sunlight to encourage diverse vertical movements.



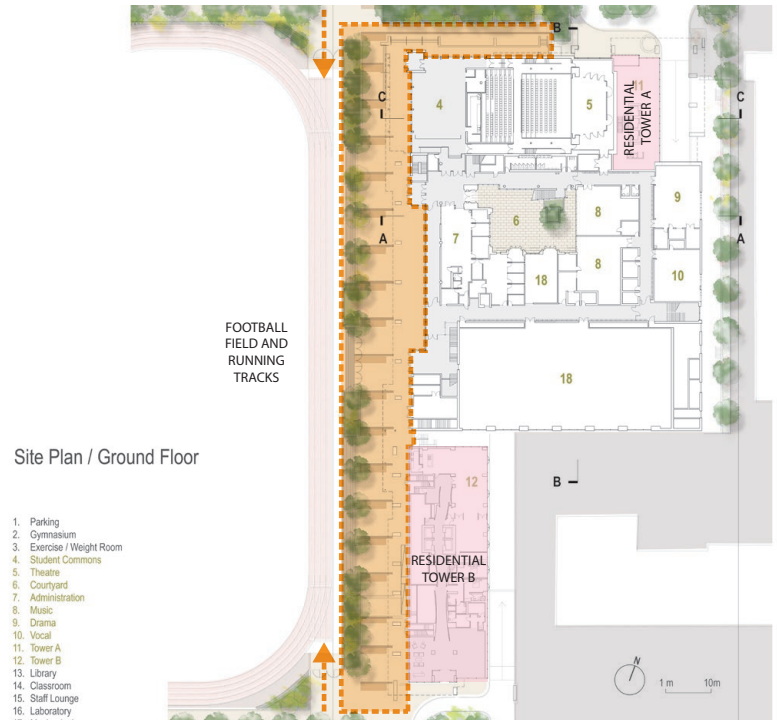


Figure 125 Interior and exterior photographs

Figure 124 Ground floor plan hight-lighting the public corridor and access to the open field.

Figure 126 West elevation through the public corridor.

IV. Urban Planning, Zoning Regulations, and The Financing model

Precedent Summary

North Toronto Collegiate Institution (NTCI) | Toronto, Canada
CS&P Architects

Gross Floor Area:
14500 m²

No. of Students:
1200

Year of Completion:
2012

- Innovative school expansion private/public partnership project.
- Two high-rise residential developments on site to finance the construction cost of the school.
- Public field and cross-block corridor connection.
- Community access to school facilities.
- Innovative urban planning strategy

1. Community Integration and Land Optimization

Consider the school an integrated part of the community and its neighbourhood. Allow the facility to be shared with other schools and associated residential / community amenities. Take advantage of the nearby facilities and use them as potential educational resources in the master planning of the school premise – borrowing space to reduce area used for specific purposes.

The integration of schools in the community is vital to the operation of the school and the community. The North Toronto Collegiate Institution is a school located in the urban core of Toronto's Young-Eglinton neighbourhood. The area is currently undergoing an urbanization redevelopment where condominium towers are replacing many deteriorating apartment buildings. As the density and population increases in the area, the school board has come to realize that the school spaces for students in the local schools are in shortage.

Public-Private Partnership

The NTCI campus redevelopment is a Private-Public-Partnership (PPP) redevelopment project where the Toronto school board, Tridel Builders along with the architect's team work together to design an unique urban school typology.

Mixed-Use Development And Community Access

The result is a mixed-use development where two residential towers share the site at 70 Roehampton Avenue with the four-story school. The 14,500m2 new school is designed to accommodate 1200 students, and the two residential towers include a total of 450 units. The project also includes a football field and a covered public through-block walkway that invites the public to interact with the school building on the ground floor and provides students with an outdoor space that is directly accessible from the students' common.

Urban Implication On Open Fields

A comprehensive shadow study was done during the early design development phase of the project to ensure that the public field will not be shadowed by the tall residential towers during the daytime.

Although the primary goal of the partnership was to leverage construction cost for the redevelopment of the school, the project is an example of how urban development could be benefited by proper integration of school buildings in the community.

"Schools are for the people who effectively own and run them, and one of the key priorities for the future must be to make their resources available to the wider community, to optimize the huge investment in school buildings currently underway."

Figure 127 Panoramic view of the ground level public domain and the open field at North Toronto Collegiate Institute in Toronto.

Zoning

Public school facilities and day nursery are permitted non-residential uses on a residentially zoned site. A percentage of land is reserved for schools according to demographic demands when a residential division is developed. The school may be built immediately after the housing development is completed if there is need in the neighbourhood. If the demand for school is low, the site will remain undeveloped or developed for temporary use, such as a parking lot or a temporary play field.

Redevelopment of exsiting urban residential neighbourhood puts pressure on existing school lots, since there is not a specific zoning designation for public schools. Once the land of an existing school is deemed under utilized and the lease for the school is due, the school can be taken down and be redeveloped for residential use.

Figure 128 Supermarket and school building occupying the lower levels of the tower.

Figure 129 High-rise residential development at the corner of the intersection.

2. An Innovative Financial Model

Government funded schools are subject to the public taxation budgeting and standards. The redevelopment of the school should not be costly to construct and maintain. Taking the advantage of combining site usage and financing the school building through residential developments can be considered as a model for urban schools.

Precedent Summary

252 East 57th Street | New York City, USA
Skidmore, Owings & Merrill LLP (Architect of Record SLCE Architects)

Gross Surface Area:
40585m^2

No. of Students:
Primary School - 730
Secondary School - 1400

Year of Completion:
2012 (phase 1 schools & grocery store)
2016 (phase 2 residential)

- Mixed-use high-rise in Manhattan includes 2 new schools, Luxury residential apartments, rental units, retail and supermarket wholesale warehouse.
- PPP example for school construction.
- A financial model that can be replicated for other school developments in dense urban cities.

Phased Development

Costing USD$500 million, the complete development includes luxury residential skyscraper, rental units (20% will be affordable), two new schools, retail podium and a supermarket. The project is broken down into 2 phases; the first phase is the construction of the two schools and the supermarket at the lower levels of the site. Phase two is a 59-storey residential building comprises of 268 apartments, 175 rental units at its base and 78,000 additional square feet of retail space.

Developer Pays

Private developer Would-Wide Group has signed a 75-year lease for the 1.5acre lot with the Department of Education and will pay for the construction cost of the schools. The new school will be adding additional enrollment capacity to ease the pressure on other overcrowded schools in the neighbourhood.

A Solution for Valuable Urban Real Estates

The last time the City of New York has leveraged real estate properties to building school was in the 1970s. This project "revived"[1] this development model for a contemporary school construction, and the Department of Education is now looking to expand this model to other school redevelopment projects in the city. "Because our capital needs are so great versus the available resources, we are looking to greatly expand this model," Mr. Smarr said.[2]

"One of the problems with the program, according to Mr. Smarr, is that it only benefited schools in Manhattan, where real estate values are higher and zoning allows denser development."[3]

1 David Lombino, "New Schools, 59 Storey Tower To Rise at 57th St. and Second Ave." New York The Sun. http://www.nysun.com/new-york/new-schools-59-story-tower-to-rise-at-57th-st/41182/. Access Nov 15, 2017.
2 Ibid.
3 Ibid.

Figure 130 Interior and exterior views of Teikyo University Elementary School

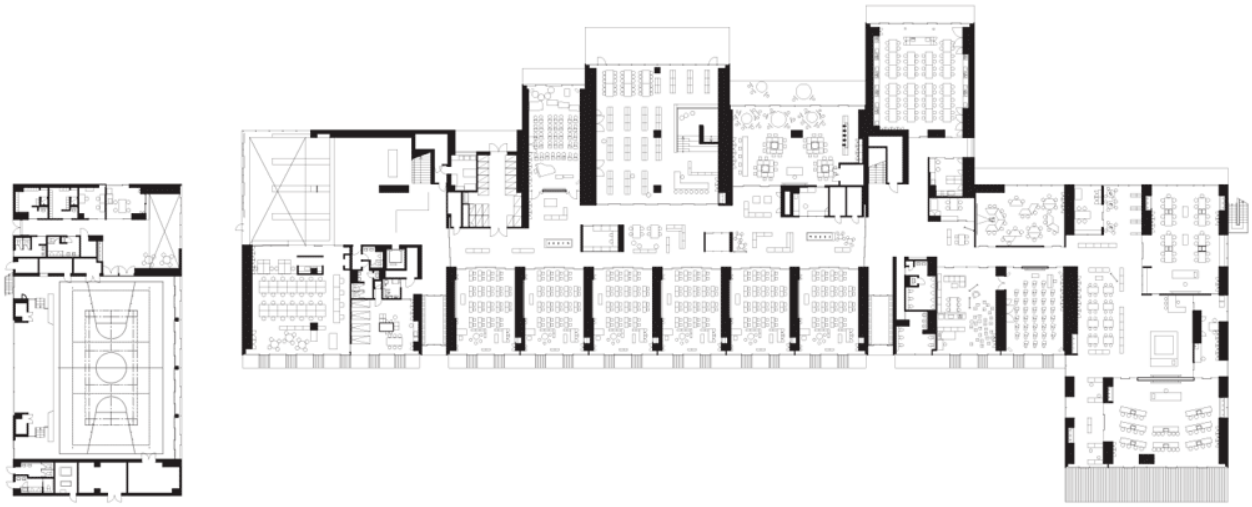


Figure 131 Floor Plan

Precedent Summary

Teikyo University Elementary School | Tokyo, Japan
Kengo Kuma and Associates

Gross Surface Area:
7780m^2

No. of Students:
--

Year of Completion:
2012

- Wood as main material for warmth and softness in children spaces.
- Recycled construction materials such as straws and rush were used as opportunities to educate about sustainability.
- Shape and form of building us a response to the natural environment around the school.

1. Material Selection

It is important that students feel comfortable and calm at school. The material chosen for the school should provide a sense of identity, domesticity, comfort and warmth that allows students to focus on their intellectual, physical and, emotional development.

The choice of material in a school is a way to portrait the school's ambition on sustainability and to reflect the educational approach of the school. Use natural substance, i.e. light, grass, rocks, trees as part of the architectural composition of the school to encourage interactions with the natural environment. A minimal selection of materials is encouraged to reduce cost and encourage a sense of community.

2. Life Cycle and Re-usability

Schools subject to expansion and alterations over time. Materials selected should be able to durable and can withstand the local climate.

The construction of the initial building adopts modular construction methods that facilitate construction efficiency, minimize construction wastage, employs sustainable building strategies and allows for easy integration of future expansion and renovation.

Figure 132 Virgo Fidelis Convent School constructed by prefabricated elements with a golden mesh finish

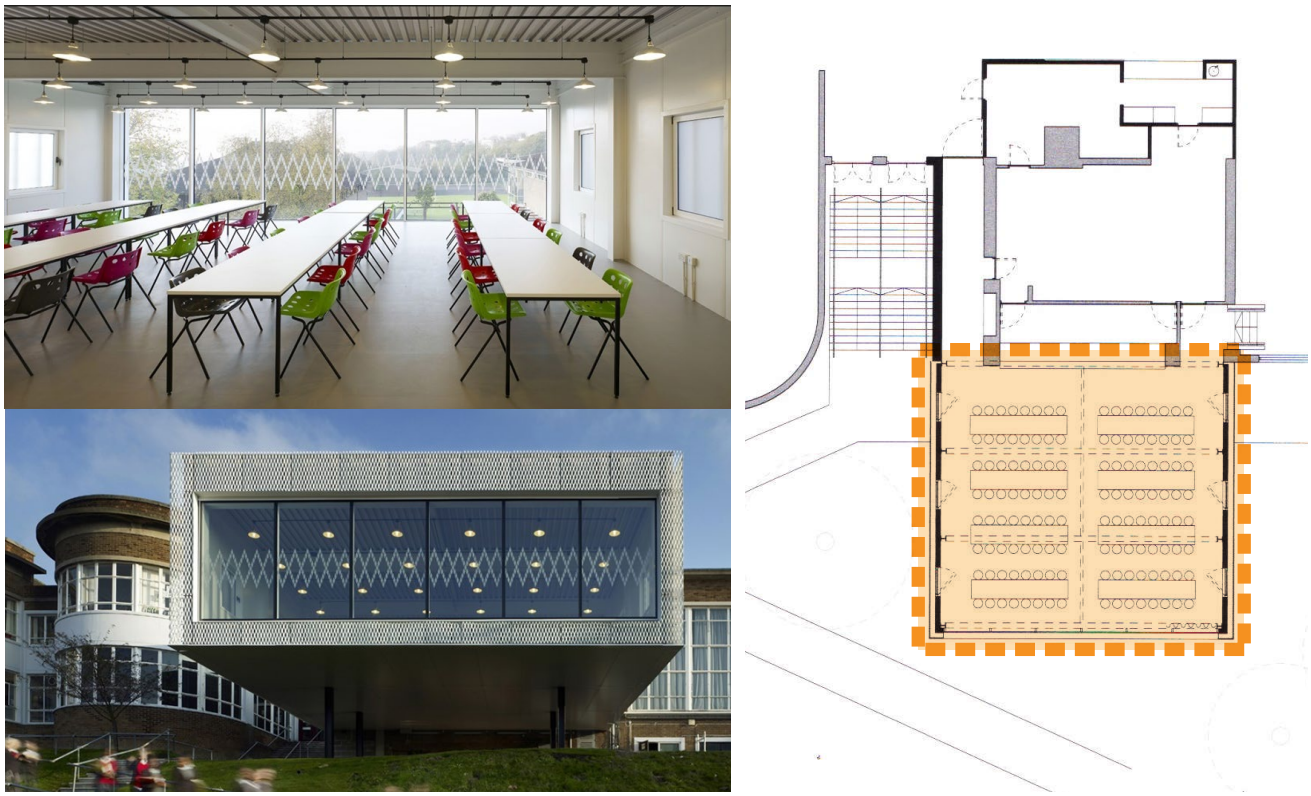


Figure 133 New extension of the Westwood Girl's College (highlighted) constructed by the same set of "flat-pack" and prefabricated elements with a silver mesh finish.

3. Fast pace modular construction method

Using prefabricated components for the school's structure, envelope, and vertical transportation elements allows the schools to be constructed in a short period without interrupting the school term, construction can happen during the summer period when the school utilization is low. A cost-effective approach to building multiple similar schools in other locations with similar site conditions.

Precedent Summary

Westwood Girls' College for Languages and Art & Virgo Fidelis Convent School | London, UK
Duggan Morris Architects

Gross Surface Area:
135m^2 & 125m^2

No. of Students:
N/A

Year of Completion:
2010 & 2011

- Two separate school's extension using exact same prefrabricated building components.
- Altering material finishes to provide a sense of identity
- Construction duration for both projects is 20 weeks.

Morris uses inexpensive and easy to obtained prefabricated components to construct both of these projects to their suit the qualities and limitations of their respective sites[1]. He emphasizes that, although these designs are based on basic elements and similar construction details, the need for an architect to overlook the design and construction process is still necessary as site-specific design adaptation is crucial to the success of this type of construction method.

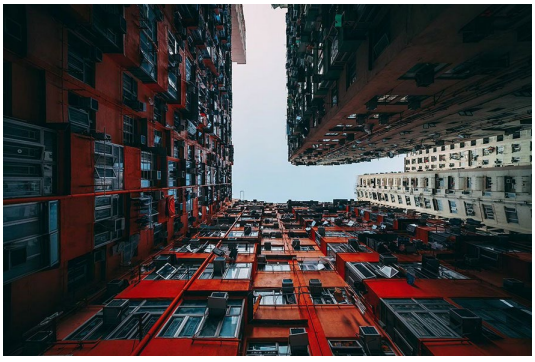
Material Palette:
Roof deck: Corus acoustic metal profiled sheet decking
Roof insulation: Kingspan rigid insulation set to fall
Roofing: Sarnafil single-ply membrane roof system
Mesh cladding: Ash & Lacey expanded aluminum mesh
Windows: Smart system windows
Linoleum flooring: Forbo

'Our ambition was to show how a basic palette of materials with flat-pack and prefabricated components could, with design skill and ingenuity, create site- and programme-specific buildings to suit a range of needs,' says director Joe Morris.[2]

1 Howard Evans. "Refurbishment and Extension of Existing Schools". Building Schools: Key issues for comtempoary designs. 214-215.
2 Felix Mara. " Pavilions for Westwood Girls' College for Languages and Art, and Virgo Fidelis Convent School, Croydon, by Duggan Morris ". The Architects' Journal. https://www.architectsjournal.co.uk/home/pavilions-for-westwood-girls-college-for-languages-and-art-and-virgo-fidelis-convent-school-croydon-by-duggan-morris/8626209.article . Feb 9, 2012. Accessed Dec 15, 2017.

Figure 135 Hong Kong Skyline

Figure 134 The major geographical areas in Hong Kong are the Hong Kong island, the Kowloon peninsula, the New Territories and other surrounding islands. These areas are sub-divided into 18 districts.



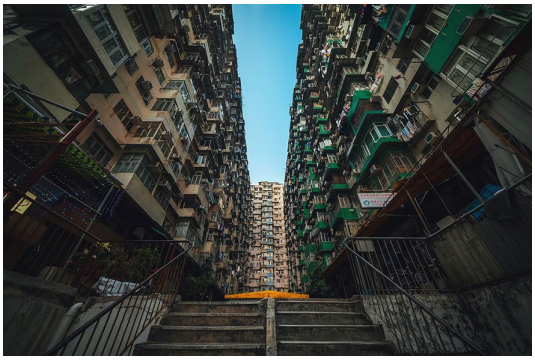


Figure 136 Photographys from "Stacked - Hong Kong" architectural photography series by photographer Peter Stewart based in Australia. The series showcases the beauty of the repetitive natural of Hong Kong's urbanism.

Part 5 | Design Proposal

Backgrounds

City: Hong Kong

The population of Hong Kong is expected to grow from 7.34 million in 2016 to 8.2 million in 2046.

Hong Kong has always been perceived from an aerial point of view that renders the cityscape as a sea of skyscrapers with mountains and sea in the backdrop. Or from a bottom up view point gazing at the geometric "sky blocks" framed by the tops of tall buildings. These images represented approximately 25% of the landscapes of Hong Kong, because 60% of the land is nature on a hilly terrain, (excluding the harbor and the sea) and only a quarter of the land is developable.

High Vertical Residential Development Ratio

To cope with the challenging topography, Hong Kong's urbanism adapts by relying heavily on the layering of networks and infrastructure topped with tall skyscrapers. Council on Tall Buildings and Urban Habitat ranks Hong Kong the no.1 city in the world by the number of 150m+ completed buildings. Based on buildings over 150m in height, 73% of the tall buildings have residential functions, offices and mixed-use functions are 19% and 5% respectively[1]. The 2017 Turner and Townsend International Construction Market survey shows that the expected economy for construction will continue to rise with the help of new mega-infrastructure projects and that residential developments will continue to be one of the main focus of the market. "In the residential sector, private apartment supply is expected to hit a 12-year high as the market looks to capitalise on strong expected price growth."[2]

1 CTBUH. "The Skyscraper Center – Hong Kong Facts". Council on Tall Buildings and Urban Habitat. 2017. http://www.skyscrapercenter.com/city/hong-kong. Accessed Nov 23, 2017.
2 Turner & Townsend. "China – Hong Kong", International Construction Market survey 2017. 38

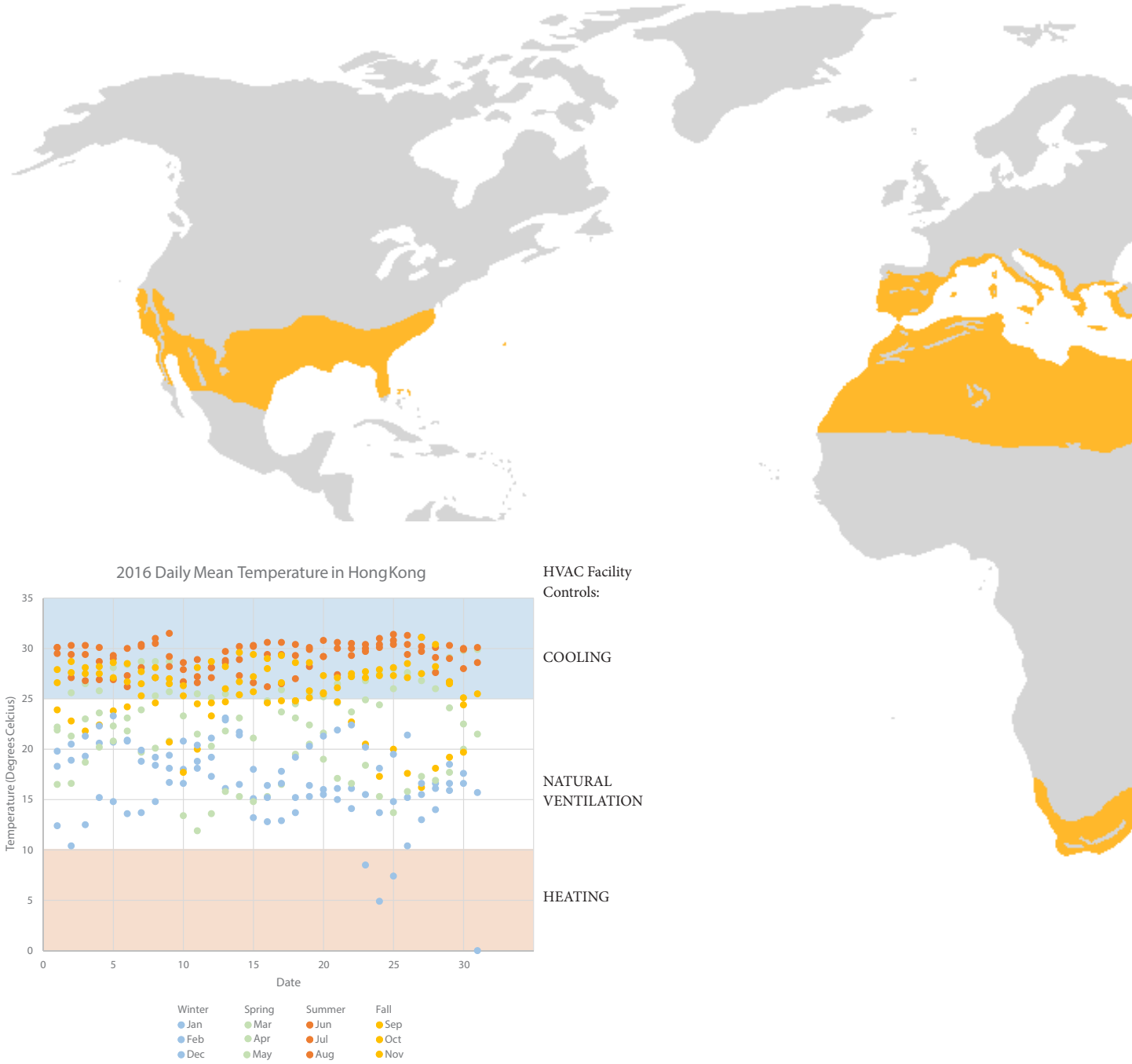


Figure 137 Seasonal conditions and building HVAC controls expectations.

Population

Hong Kong's population was approximately 7.31 million in 2015.
Population density: 6 760 people per square kilometer

Geography

Total area: 1 105.7 square kilometers
Land developed: less than 25%
Country parks and nature reserves: 40%

Sub-Tropical Climate

Spring and Summer - hot and humid; 28-40 degrees Celsius
Autumn and Winter - 10-20 degrees Celsius
Humidity: 60-80% throughout the year

Figure 138 Subtropical geographical climate zones highlighted in yellow.

Figure 139 Hong Kong's rapid metropolitan development - multi-layers urban "ground plane" in the Central district of Hong Kong Island.

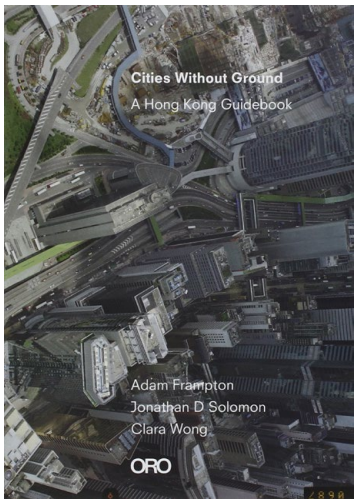
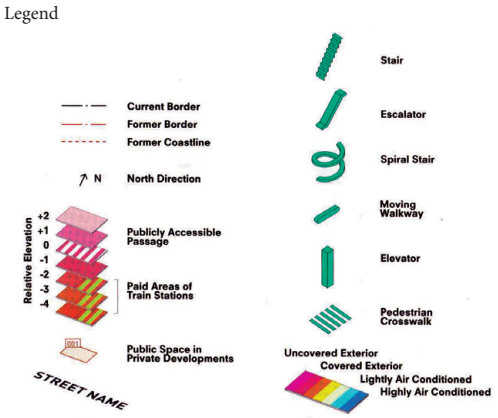


Figure 140 Frampton's "Cites without ground - A Hong Kong guidebook"

Hong Kong Urbanism: The "Thick" Ground

Navigating through skyscrapers - the weaving networks of roads, tunnels, underground infrastructures, urban landscaping, retail podiums, air conditioned and unconditioned covered walkways merges together to form the typical 3-6 storey "thick" interlacing fabric at the base of Hong Kong.



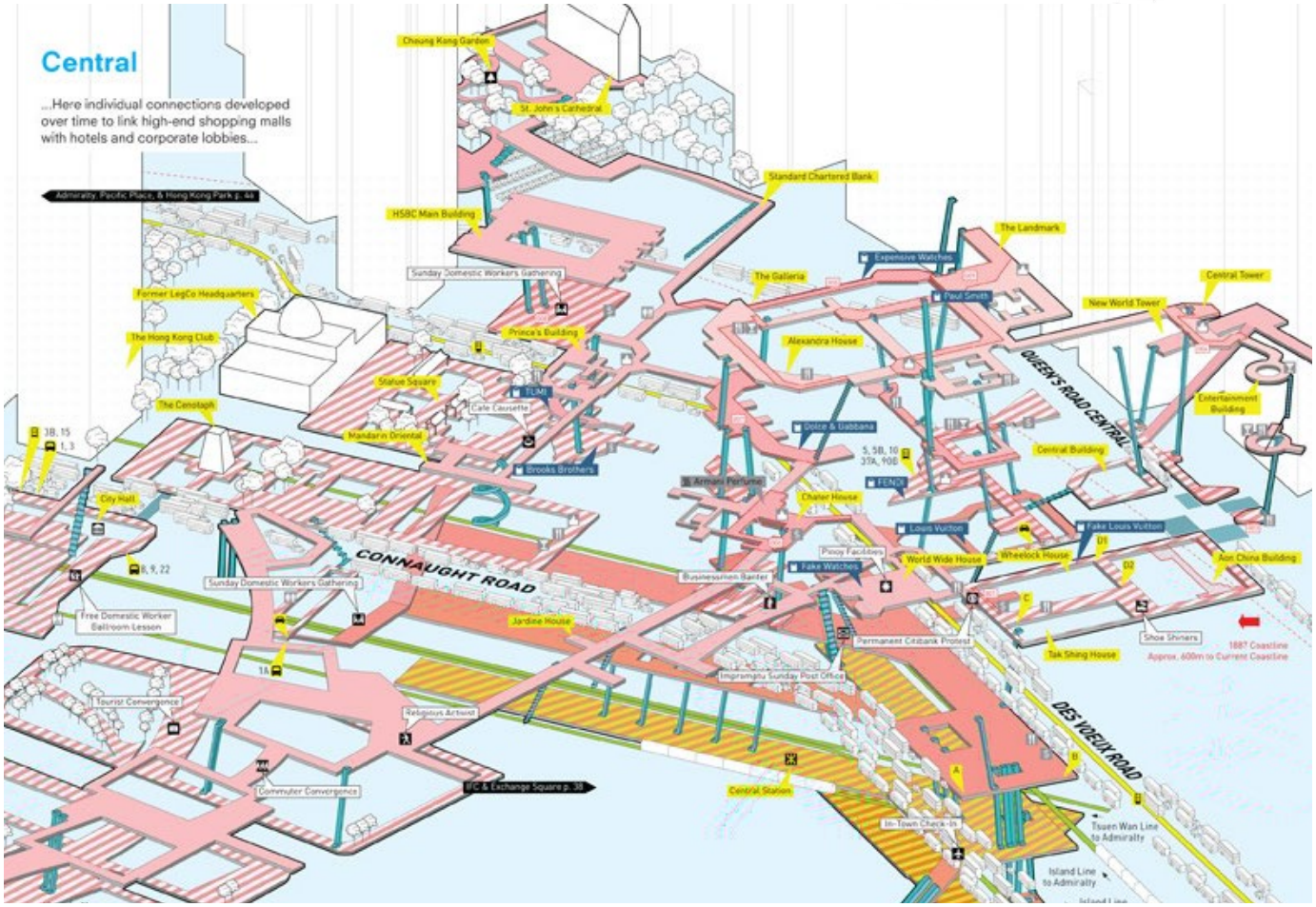


Figure 141 Legend and map of Central elevated networks "Cites without ground - A Hong Kong guidebook".

Figure 142 West Kowloon station development

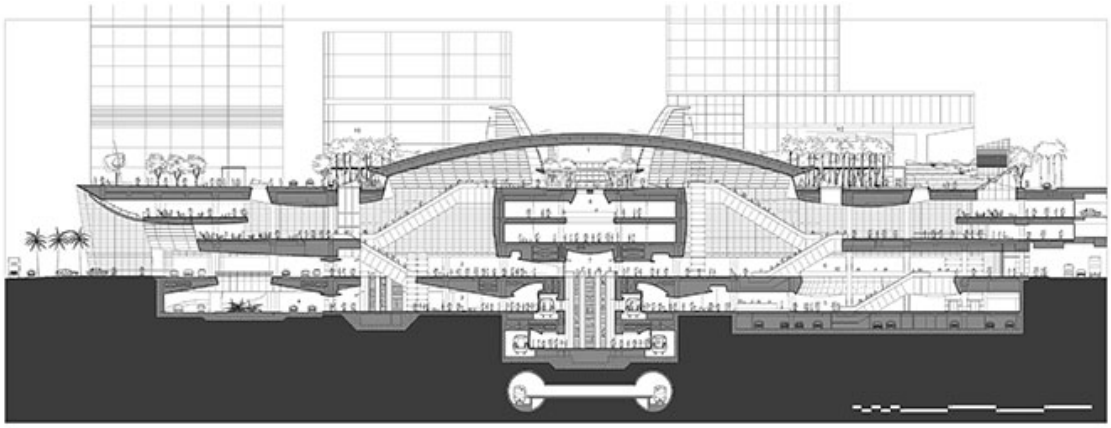


Figure 143 Sectional drawing of the concourse shoping centre.

(Top) Photograph of the West Kowloon station development. (Bottom) Kowloon station mixed-used development's base levels is a large retail concourse shopping centre that connects to the underground subway system. A the top of the shopping center is a rooftop terrace populated with public landscaped parks and restaurants.

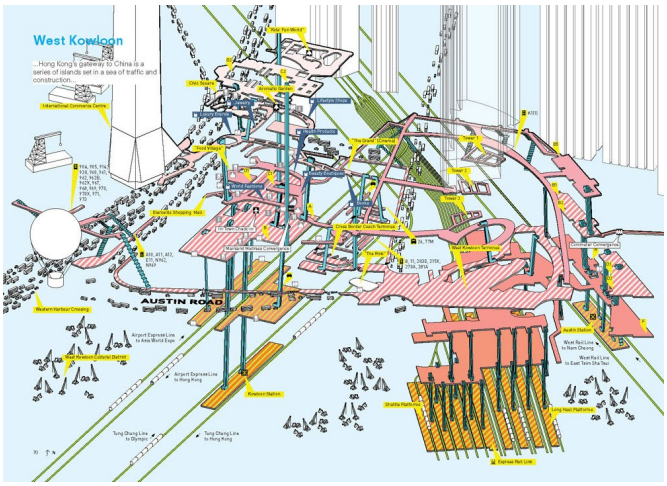


Figure 144 An illustrated map of the West Kowloon pedestrian network from Cities Without Ground: A Hong Kong Guidebook. A spatial guide to the complex public multi-level "ground" network of Hong Kong.

Transit-Oriented Development (TOD)

Transit-Oriented Development[1] is the most successful property development model in Hong Kong. The model is the foundation to the vibrancy of the city. As explained the in rail-property institutional diagram, it improves property accessibility and increses land value which helps with the social and economical growth by promoting a sustainable urban living style.

1 Cervero, Robert. The Transit Metropolis - A Global Inquiry, Island Press, Washington D.C., 1988.

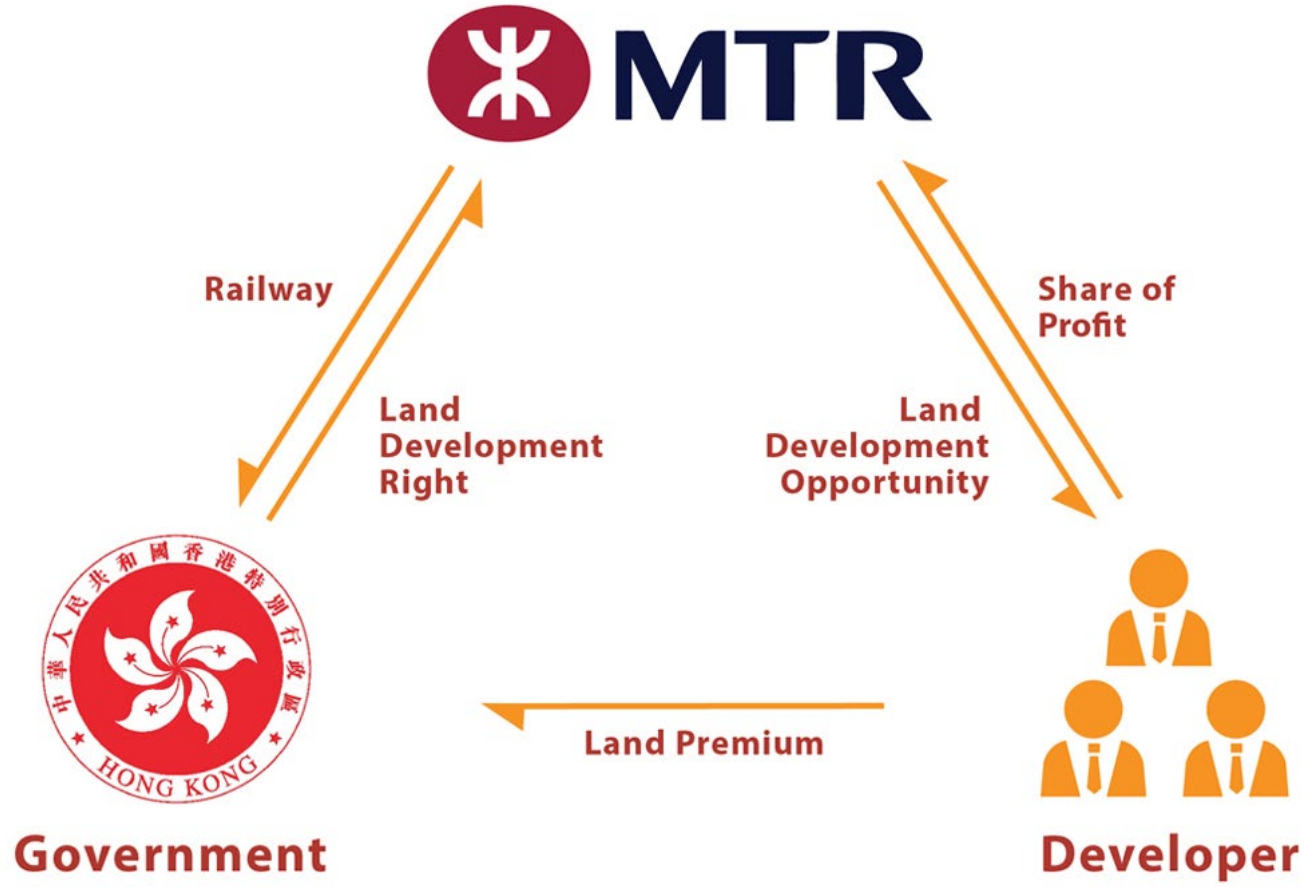


Figure 145 A diagram showing the institutional structure of the rail-property development

Figure 146 A section of the mid-levels outdoors escalator walkway in Central, Hong Kong.

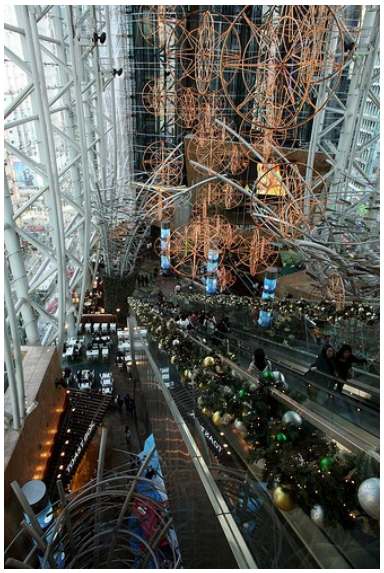


Figure 147 Langham Place shopping mall interior view

Figure 148 Time square shopping plaza interior view

(Figure 146) Central mid-levels escalator walkway system is a 800m long and rising 135m in height pedestrian exterior walkway. It comprises of 20 escalators and 3 inclined travelators. (Figure 147) The 4-storey continuous escalators starting from the ground level of the 15-storey Langham Place landmark shopping mall in Mong Kok, Kowloon. Above the shopping mall sits a 59-storey commercial tower and a 700 unit five-star hotel. (Figure 148) Series of escalators connection the main atrium at the Time Square shopping plaza at retail district in Causeway Bay, Hong Kong.

Mixed-used High-rise Developments and Escalators

Connecting the elevation differences between the vertical public realms from the underground levels to the bases of the towers (the lowest 5-12 storeys of the skyscrapers)is a series of escalators and a few more discreet elevators shafts. Escalators are the most popular choice for public circulation as it provides a continuous pedestrian flow at fast walking speed.

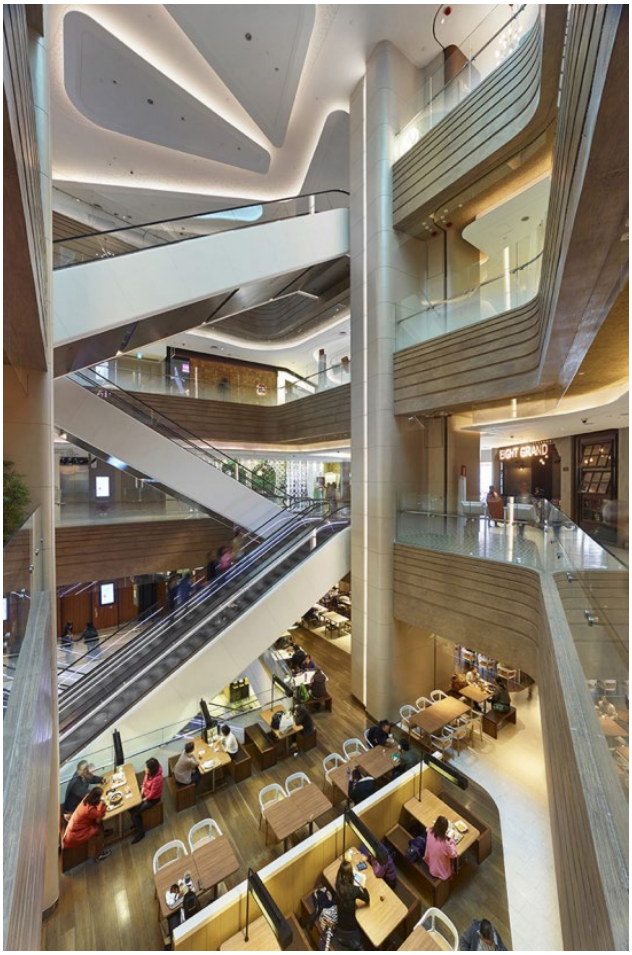


Figure 149 Interior view of Hysan Place

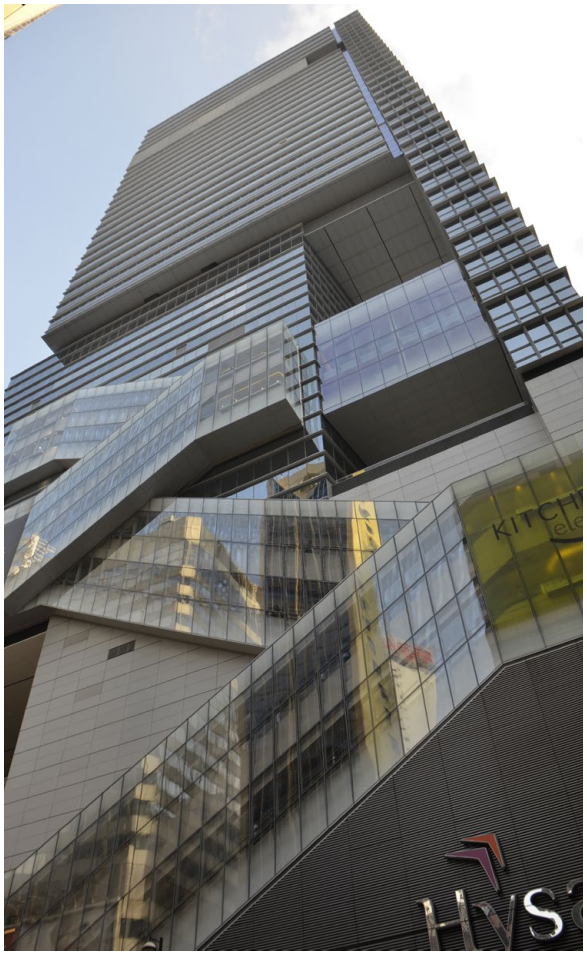


Figure 150 Exterior view of Hysan Place

Multi-level atrium and escalators are most commonly seen at the retail podiums of tall buildings. The Hysan Place is a mixed-use commercial and retail building that uses the escalators as an exterior expression.

Figure 151 Map of MTR stations in the Kwun Tong district

Figure 152 Overview of Kwun Tong residential and retail areas

Figure 154 Street-view

Density

Kwun Tong District - The densest sub-division

Kwun Tong is the densiest neighbourhood in Hong Kong. The district also has the lowest domestic median income.[1]

Main charateristics of the district includes:

- Older industrial buildings along the shoreline;
- Majority of the residential developments are public housing;
- Redevelopment plan in progress to revitalize older developments.

Population:

- Total 622,152
- Density 56,000/km2

Monthly Domestic Income:
Median $20,000 HKD (+/-$3,200 CAD)

Housing Characteristic:
Public Rental Housing 53.5%
Subsidized home ownership housing 15.8%
Private Permanent Housing 28.9%
Temporary & Non-domestic 1.8%

Proportion of Population:

0-14	11.8%
15-29	12.1%
25-44	29.6%
45-64	30.1%
65+	16.3%

1 2011 Hong Kong government census data. Census and Statistics Department. 2011 Population Census. 2015. http://www.census2011.gov.hk/en/index.html

Stree-view of older developments with retail store on the ground level (above). Main avenue in Kwun Tong. Ground level high density activity. Major public transformational hub in the Kwun Tong residential district. Similar type of interlocking networks can be found even in residential areas (right).

Figure 153

Ngau Tau Kok - Kwun Tongs Residential Neighbourhood

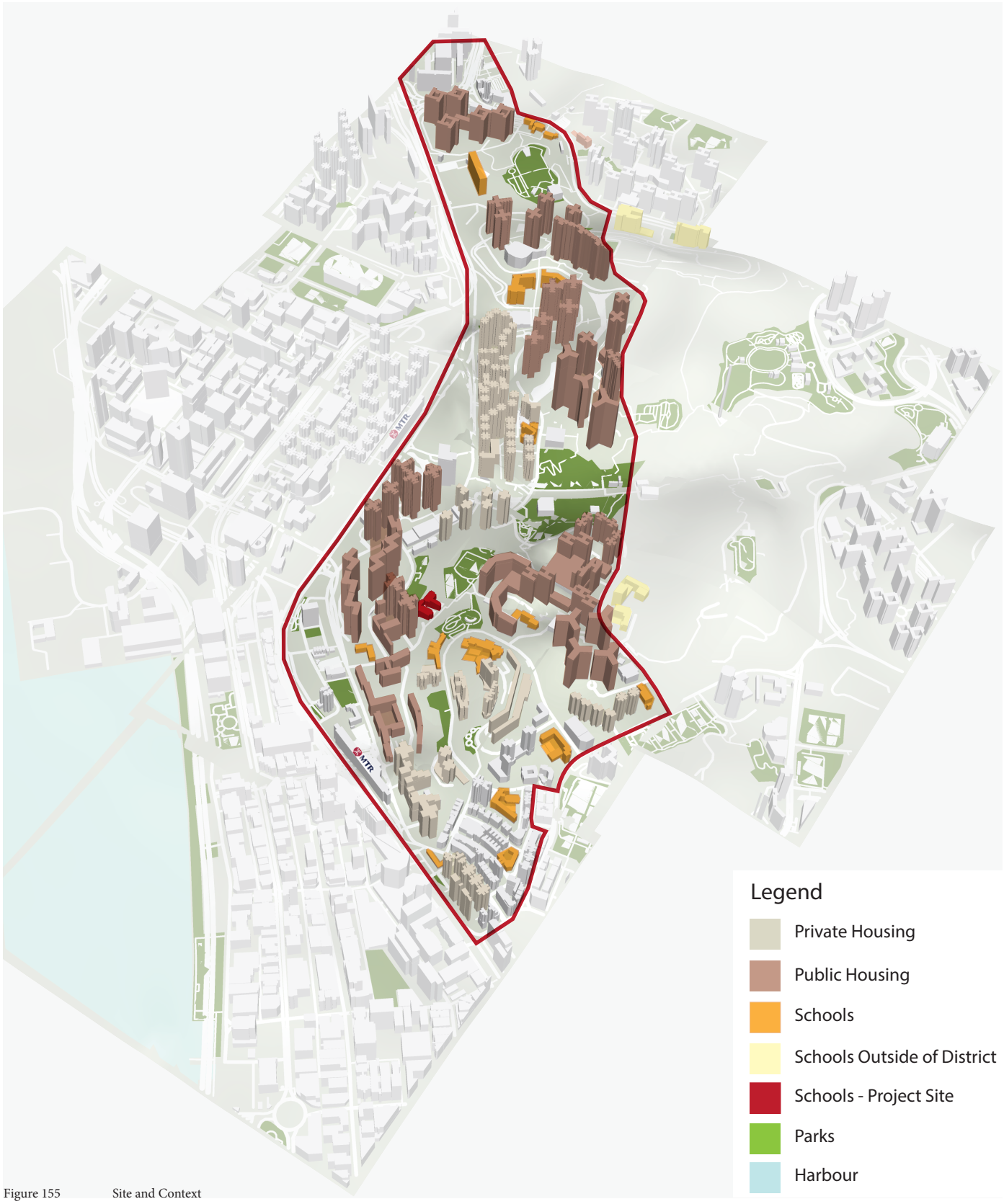
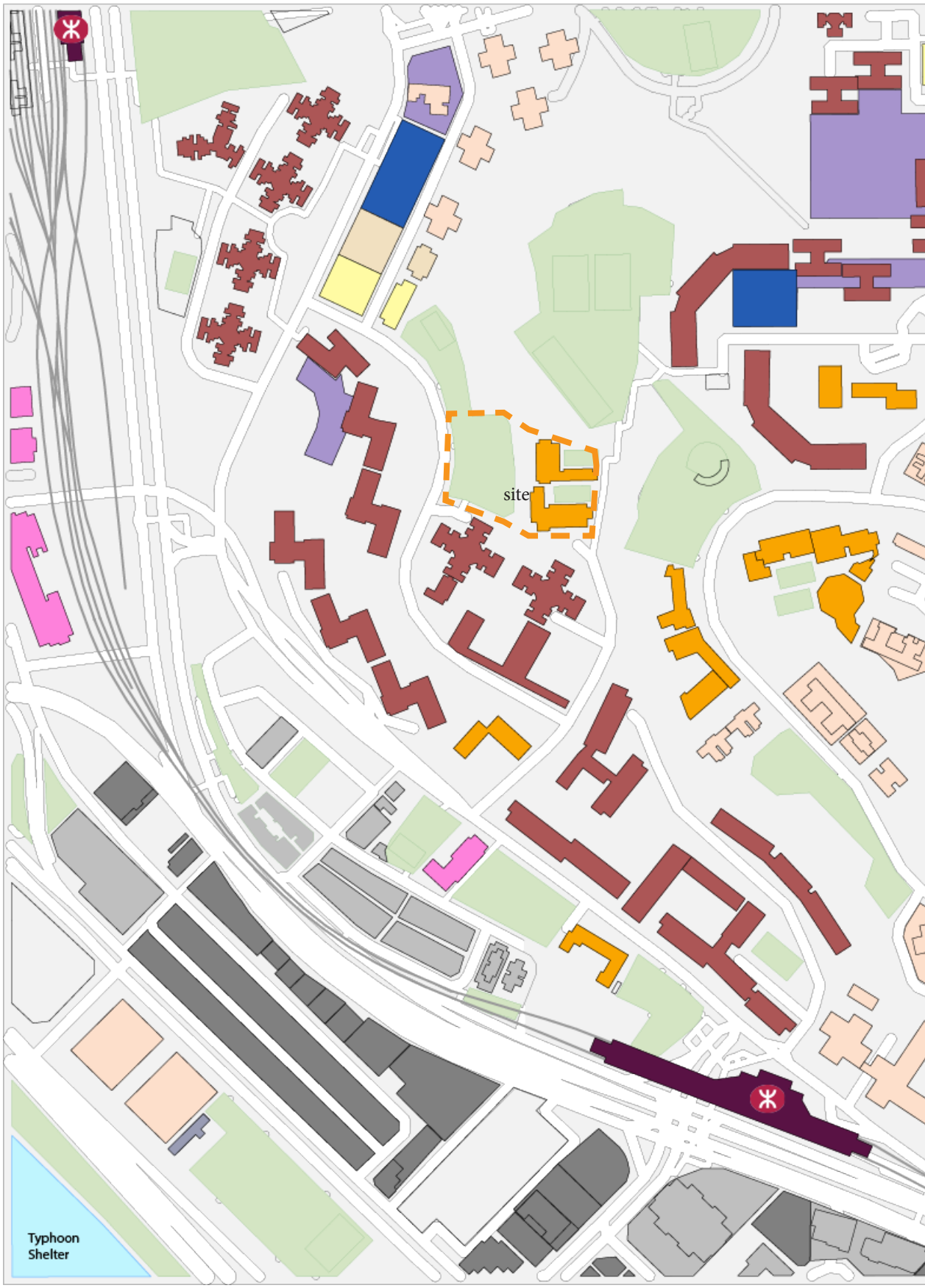


Figure 155 Site and Context

Figure 156 Overview of Kwun Tong industrial area

Figure 157 Public housing - Upper Ngau Tau Kok Estate


site
Typhoon
Shelter

Legend

Schools

Recreational Grounds

Institutional Buildings
(except schools)

MTR Transit Stations (MTR)

Water

Retail

Government Office/ Municipal Services

Community Facilities

Public Markets/ Cooked Food Markets

Private Housing Estates

Public Rental Housing Estates (Housing Authority)
Home ownership scheme Estate (Housing Authority)

Mixed Use Buildings

Induatrial Buildings

Infrastructure Facilities

Cut Slopes

Fill Slopes

Retaining Walls

Figure 158 Context mapping - programs


site

Legend

Schools

Recreational Grounds

Institutional Buildings
(except schools)

MTR Transit Stations (MTR)

Water

Retail

Government Office/ Municipal Services

Community Facilities

Public Markets/ Cooked Food Markets

Private Housing Estates

Public Rental Housing Estates (Housing /
Home ownership scheme Estate (Housin

Mixed Use Buildings

Induatrial Buildings

Infrastructure Facilities

Cut Slopes

Fill Slopes

Figure 159 Context mapping - slopes

Site: The Matchbox Schools

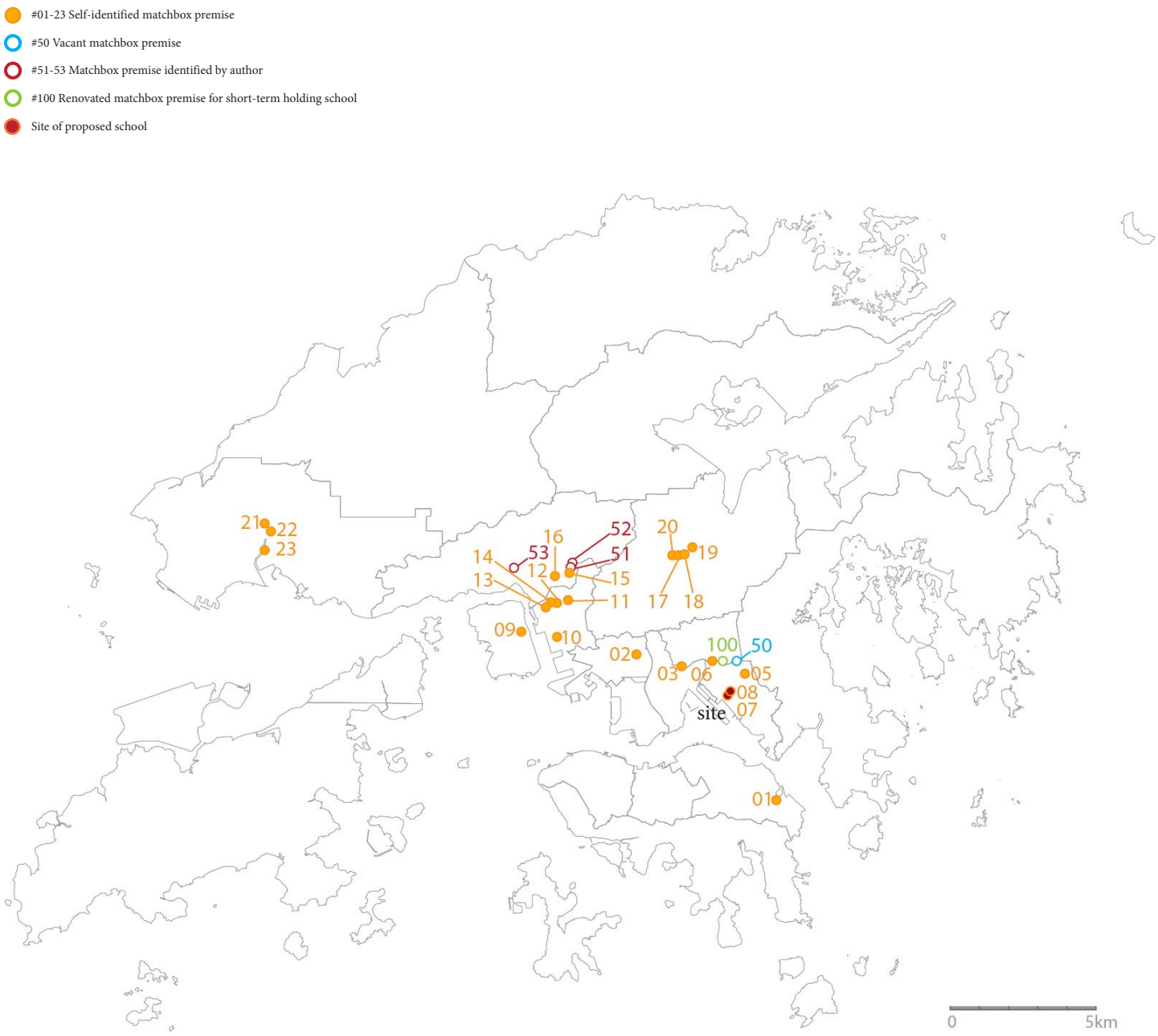
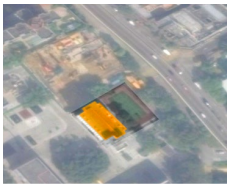


Figure 160 Map of all of the identified matchbox schools.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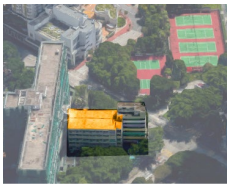
02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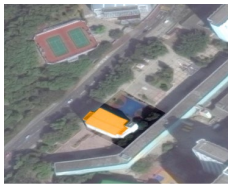
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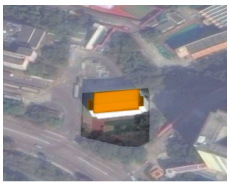
06 100 50


07 & 08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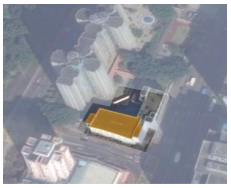
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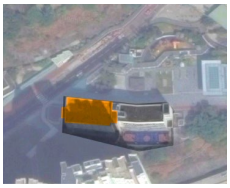
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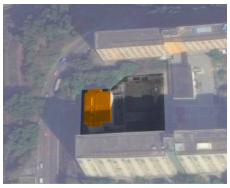
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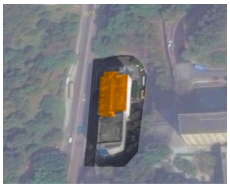
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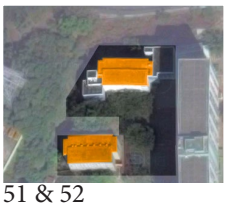
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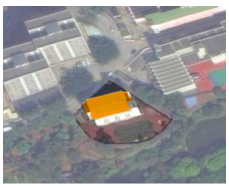
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17

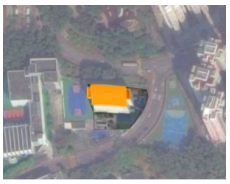

18


19


20


21 & 22


23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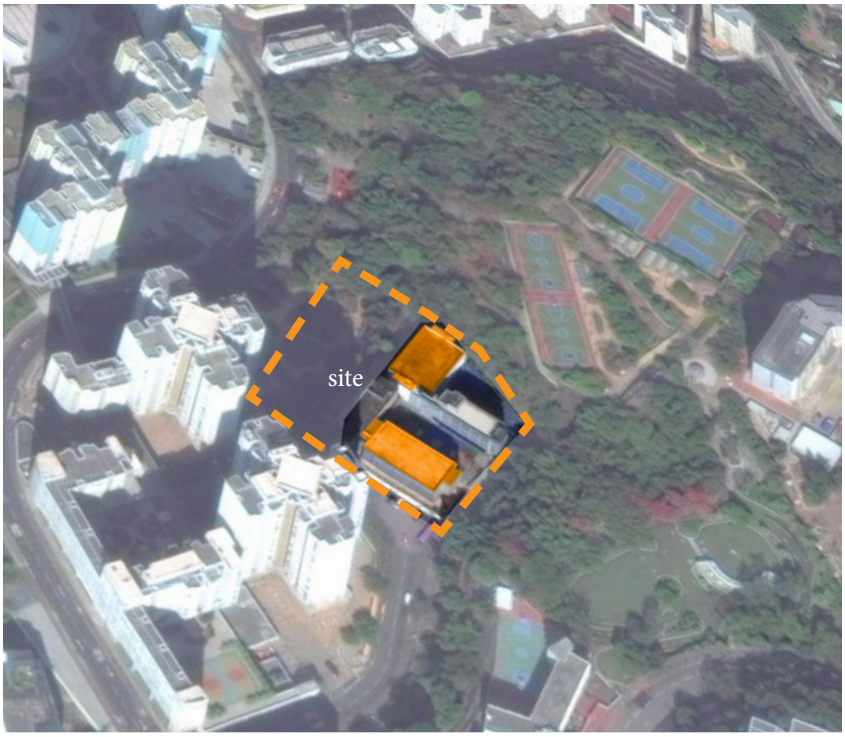
School Selected for the Redevelopment Proposal



Site: 07 & 08

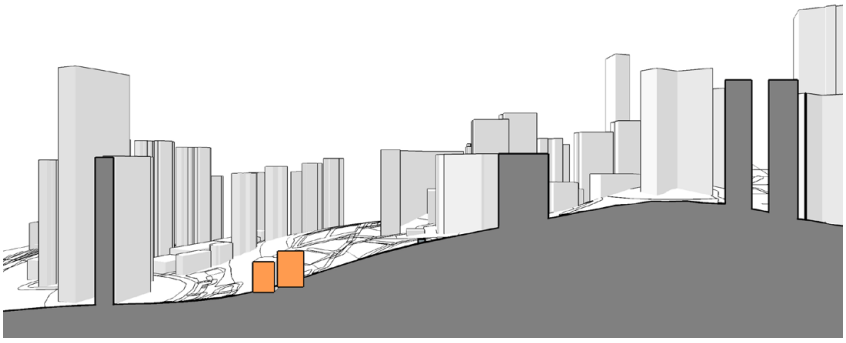


Figure 161 Site section - existing schools highlighted in orange

Figure 162

1970 Ngau Tau Kok Housing Estate

Ngau Tau Kok Estate is divided to Upper and Lower Estates in 1973. Lion Rock, Blackdown Barracks, the Joint Movements Unit of Kai Tak and Ping Shek Estate forms the backdrop of the scene. Man Kiu Association Primary School and Hong Kong Taoist Association Wun Tsuen School can be seen on the right beside the re-mediated slopes.

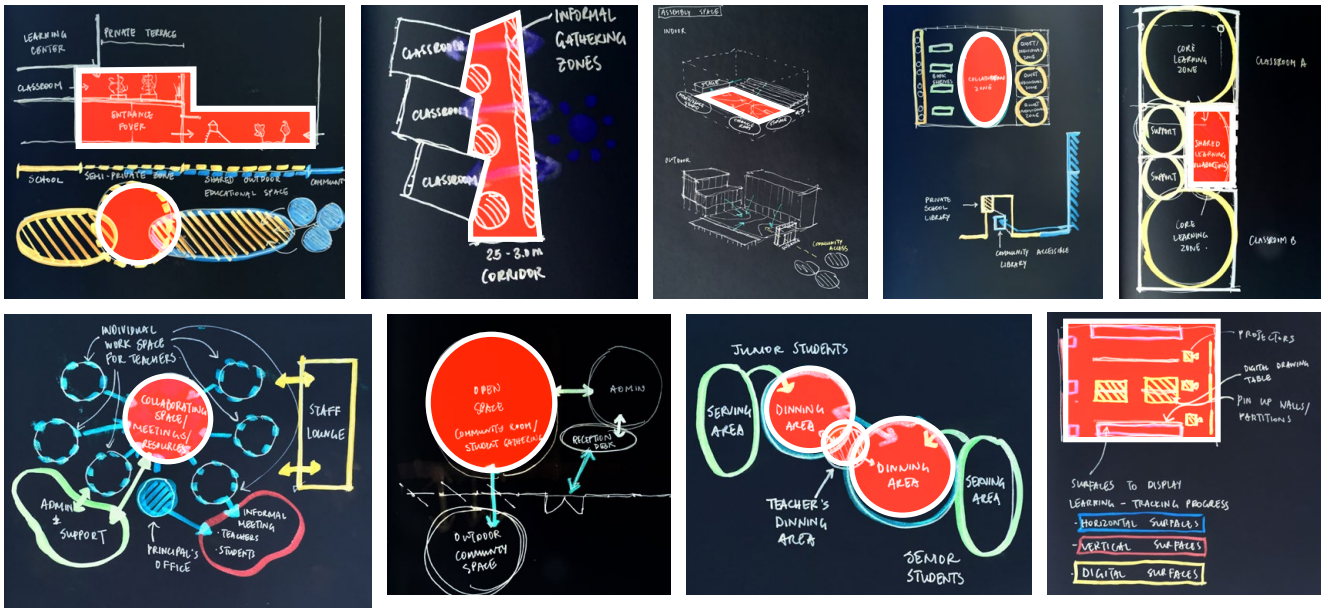
Site Condition

- Multiple Matchbox School Site Condition
- Typical Hong Kong Geographical Sloped Site - limited land
- Housing Estates Redevelopment Completed - schools left untouched
- High density area within the city - more school spots could be useful to solve population problem

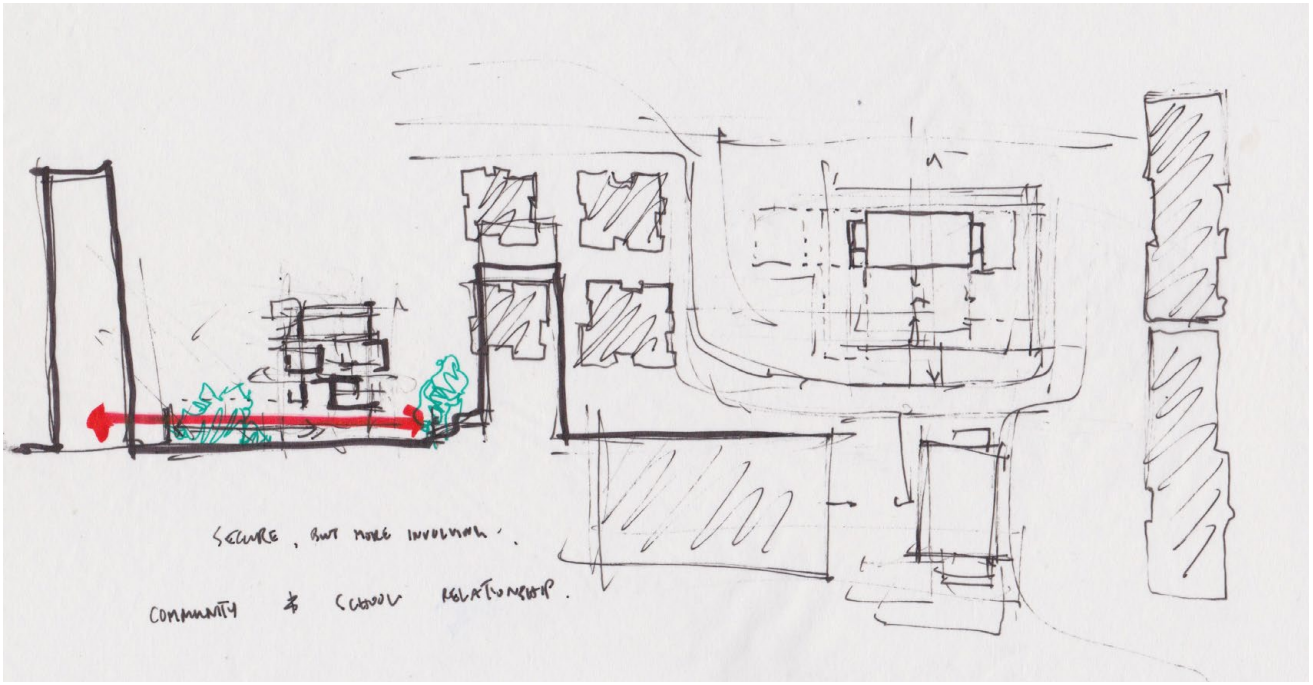
The Proposal:
An Integrated Vertical School

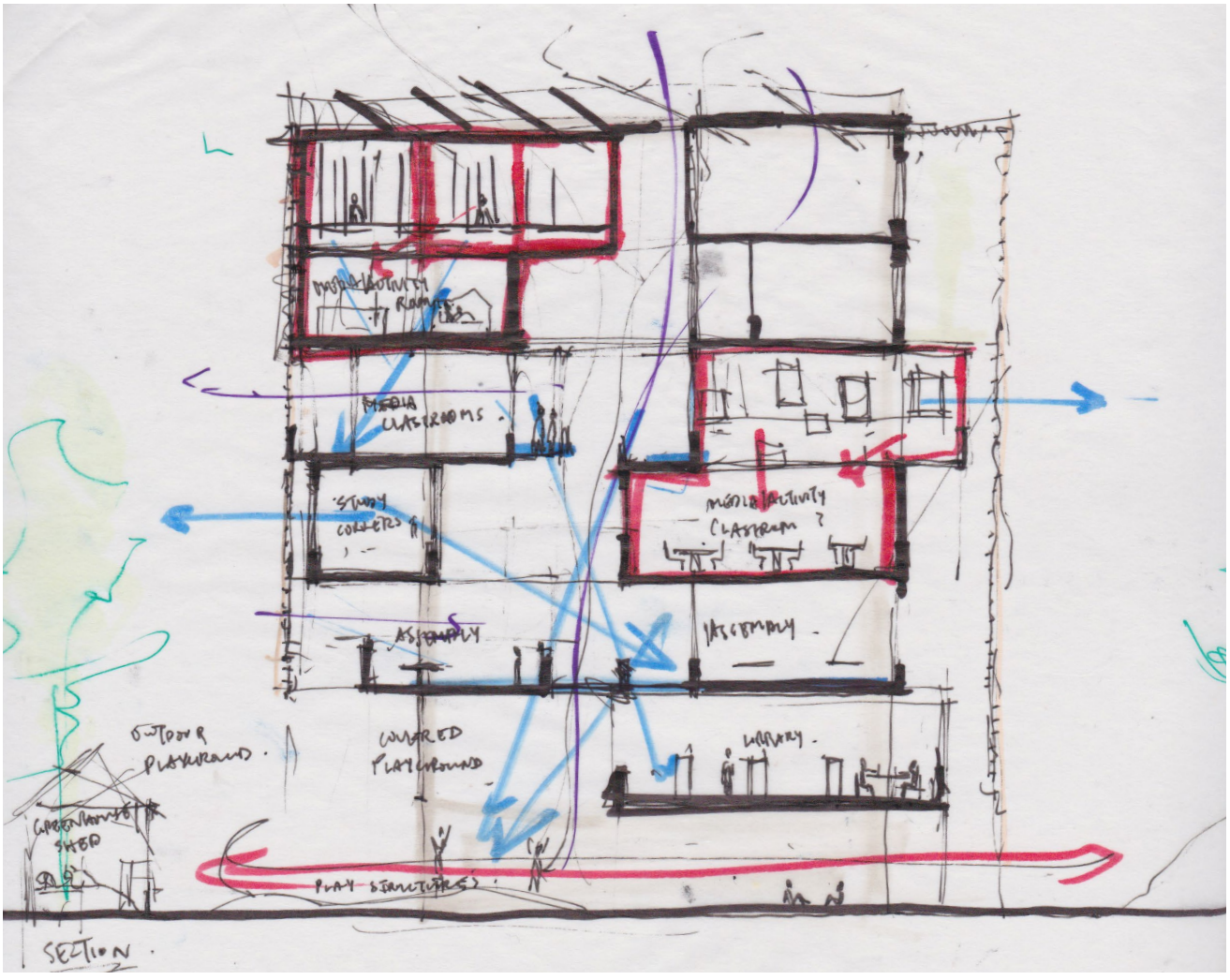
Design Concepts

Iterative process - early design sketches by author exploring the key design strategies appropriate for a 21st century innovative school.

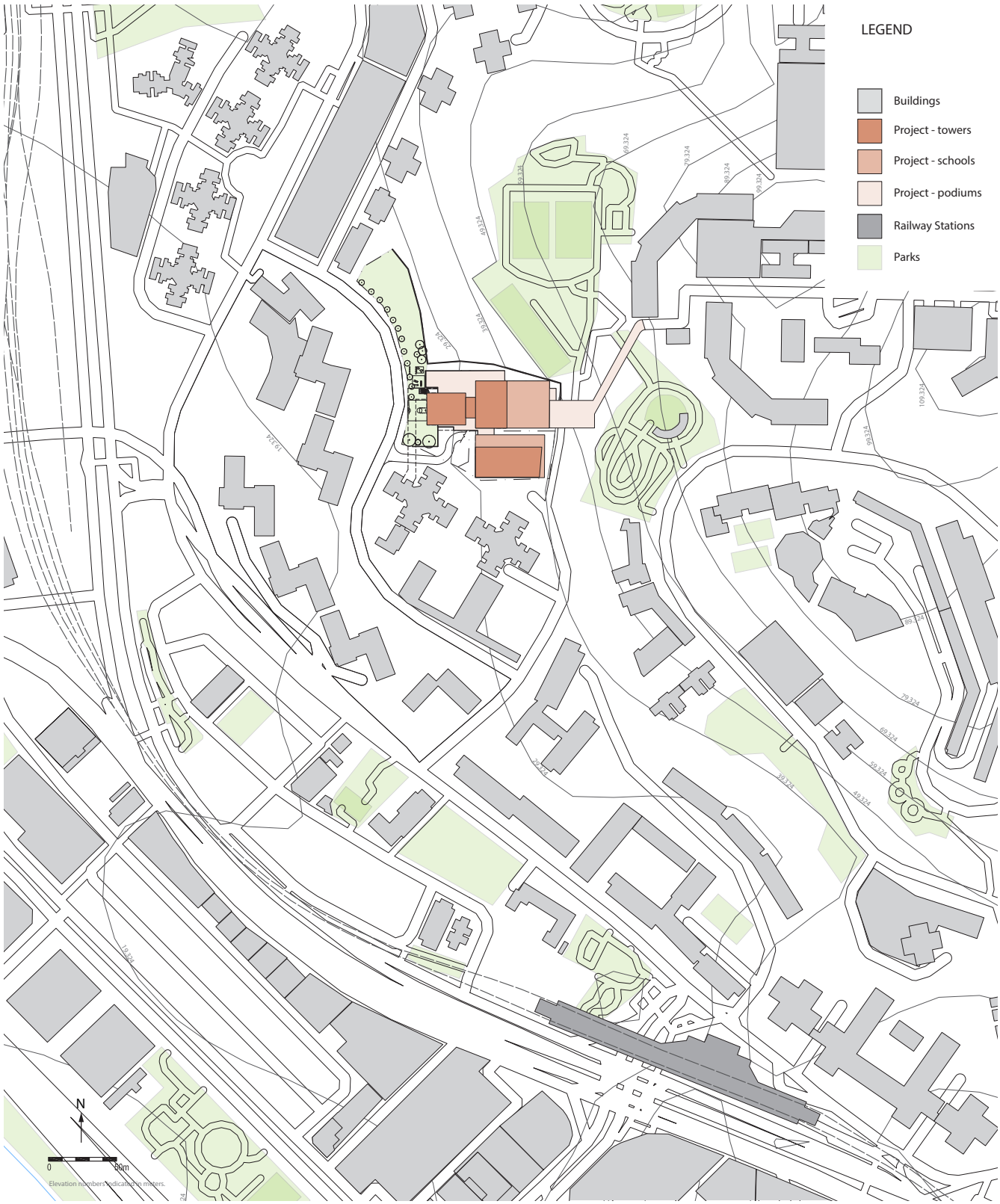


CREATING AN INFORMAL LEARNING CULTURE - A focus on the shared open spaces.


SECURE, BUT MORE INVOLVED.
COMMUNITY & SCHOOL RELATIONSHIP.

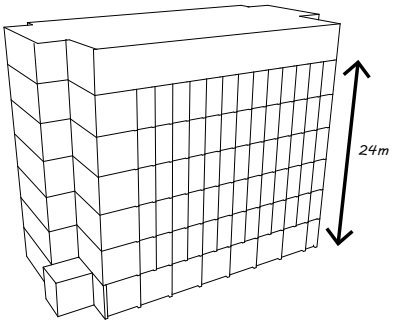

MEDIA CLASSROOMS
STUDY CORNERS
OUTDOOR PLAYGROUND
COVERED PLAYGROUND
LIBRARY
PLAY STRUCTURES
SECTION

South-east view of the development.

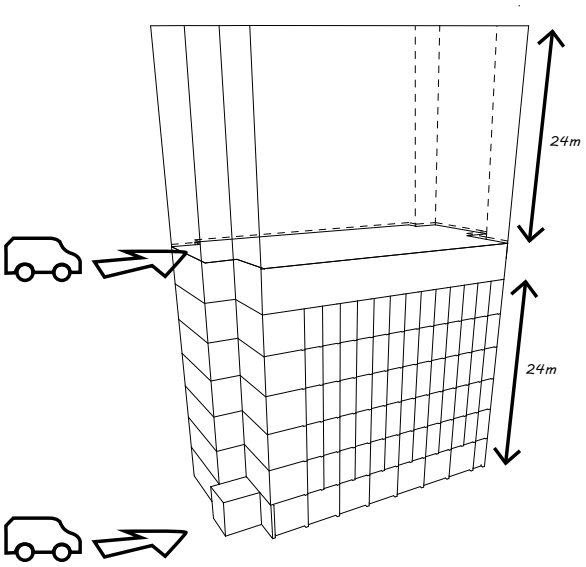


Site Plan - The railway station south of the site is approximately 10-15 minutes walk away. The site is on a stepped slop from north-east to south-west towards the harbour.

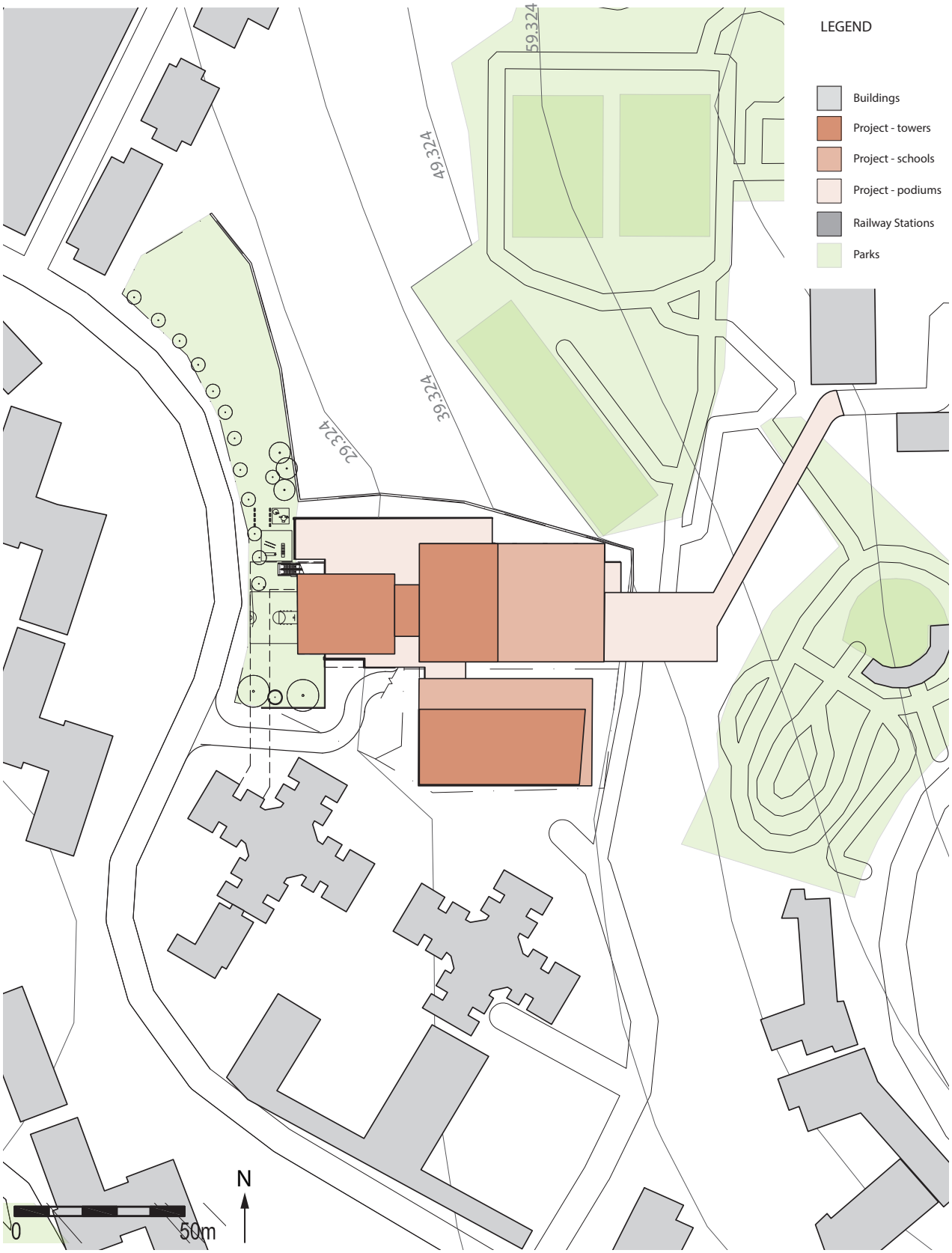
Retaining walls at the north and east side of the site allows the existing schools to be built on relatively leveled ground plane. The new development sits within the boundaries of the retaining wall at the lower levels. A bridge connection to the upper levels of the school provides fire truck access route to meet statutory fire access requirements for schools that are taller than 24 meters.



RESTRICTION - Educational building regulations limit the height of school buildings to max. 24m above ground access.



THE VERTICAL SCHOOL - taking advantage of the topography and providing both upper and lower vehicular access could extend the height of the school beyond the 24m limit.



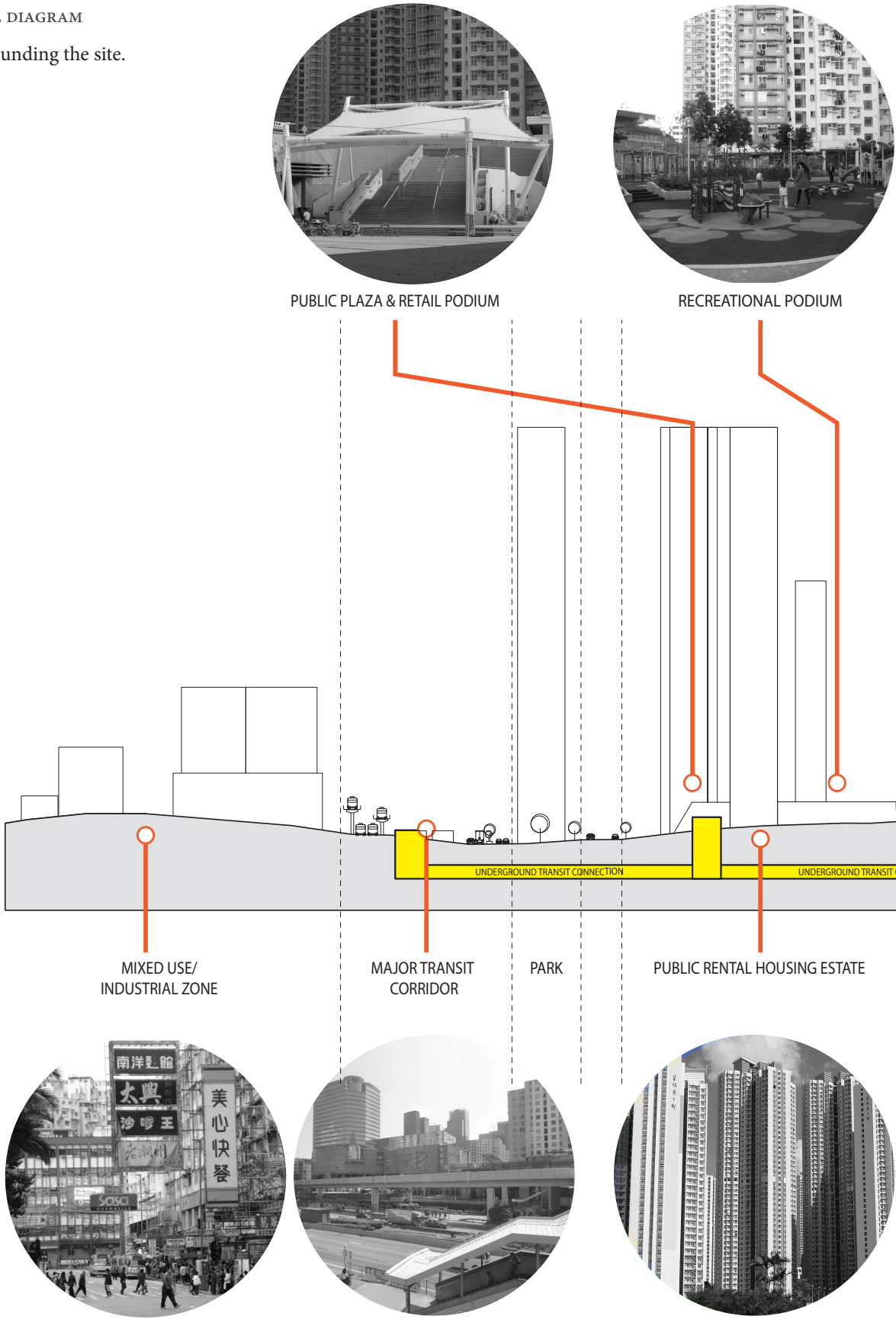
Elevation numbers indicated in meters.

Site Aerial: Existing and Proposed

Current school location highlighted in red (left) and proposed Integrated vertical school development in orange (right) - the full phase redevelopment of both matchbox schools, residential and community complex using the stacking blocks vertical school strategy.

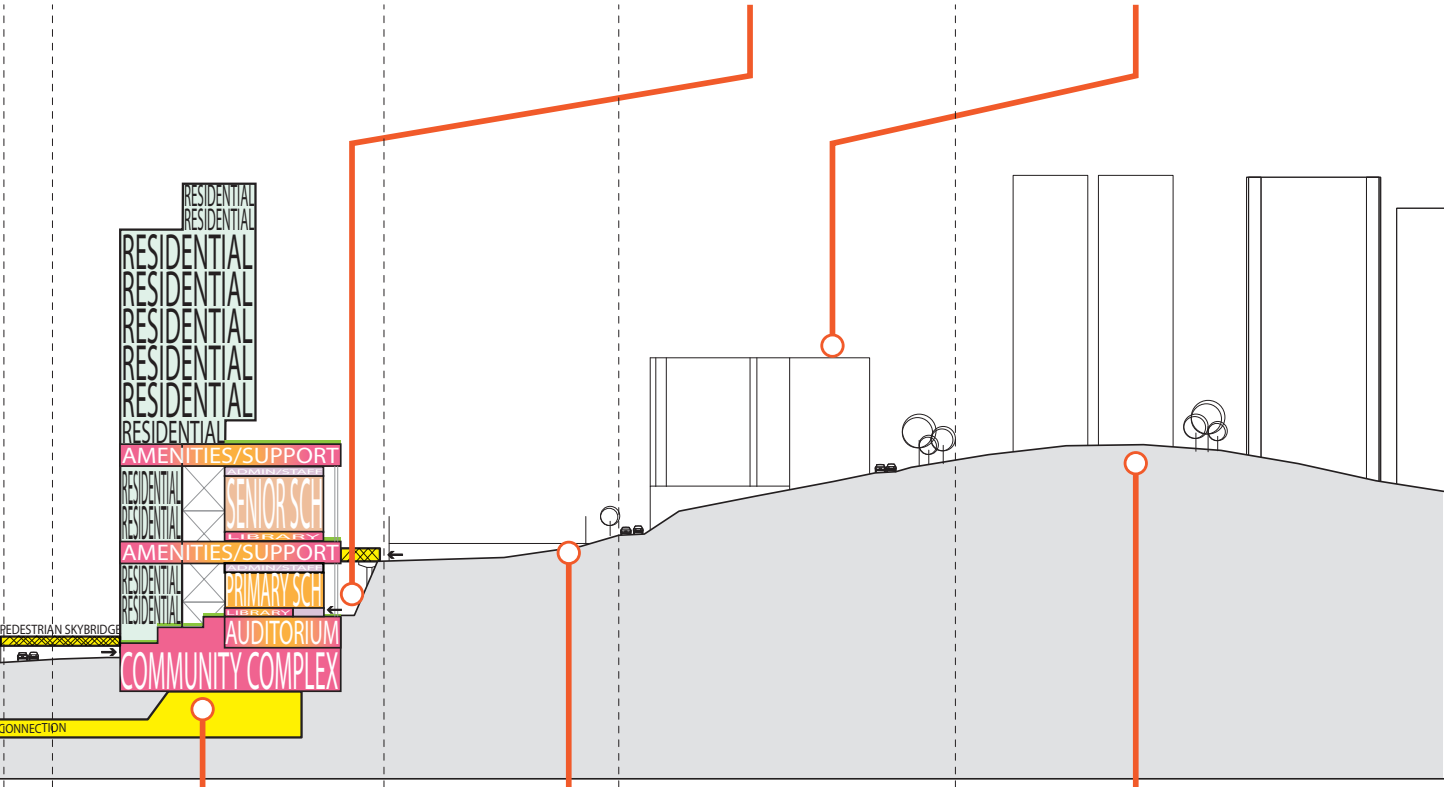
Contextual Sectional diagram

Existing conditions surrounding the site.



EXISTING SCHOOL ENTRANCE

PUBLIC RENTAL HOUSING ESTATE



PROPOSED
INTEGRATED
VERTICAL SCHOOL

EXISTING PUBLIC
RECREATIONAL SPACE

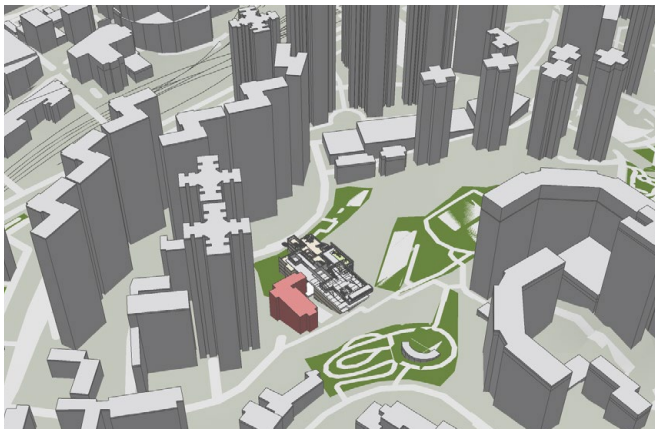
PRIVATE HOUSING ESTATE

Phasing diagram

The full build-out of the project is anticipated to occur over 10-12years. The project will be constructed in phases to minimize operational disruption to the schools, parks and other urban infrastructures.

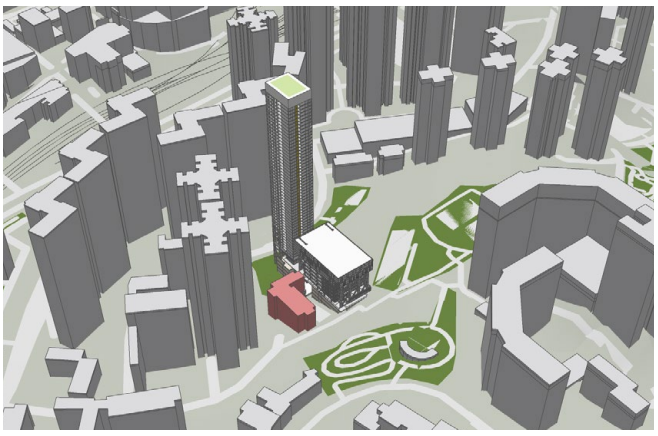
phase I, year 0 - existing condition.

phase II, year 1-2 - underground and podium construction.

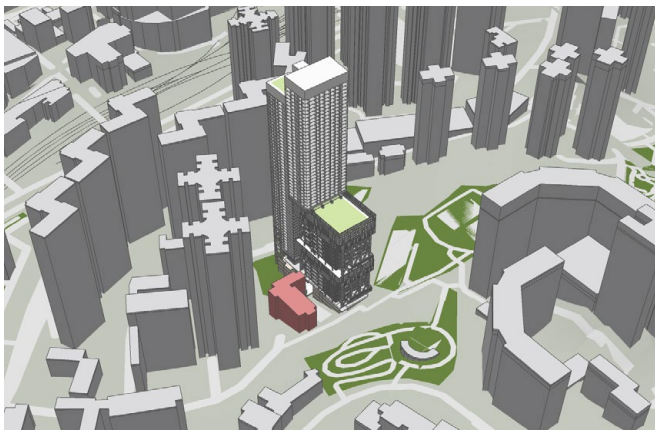


phase III, year 2 - demolition of one existing school.

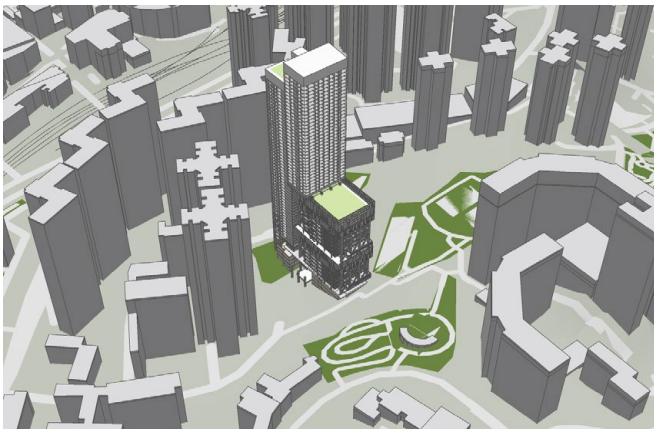
phase IV, year 3 - construction of the 1st school.



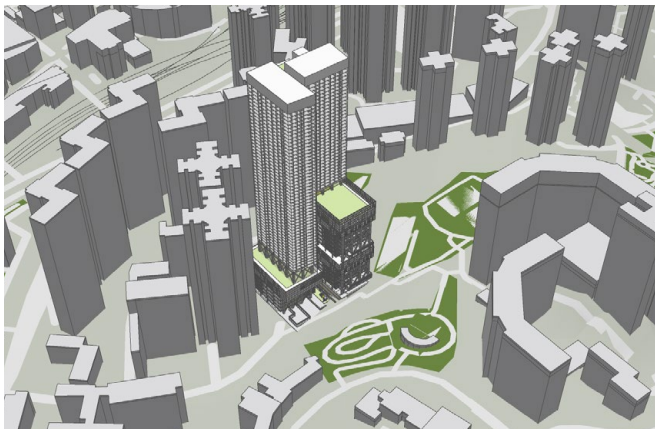
phase V, year 3-5 - construction of the 1st residential tower.



phase VI, year 5-7 - construction of the 2nd school and residential tower.

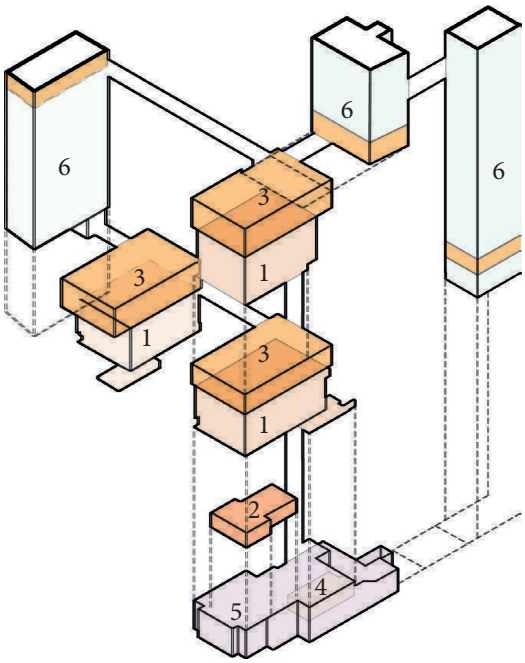


phase VII , year 7 - demolition of the second existing school.



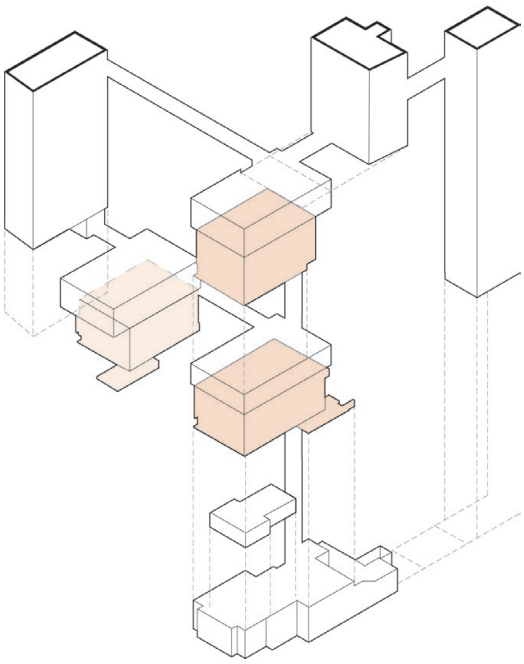
phase VII, year 7-10 or 12 - construction of the 3rd school and residential tower. Time line may differ at this point to respond to local demographics.

Program and Massing

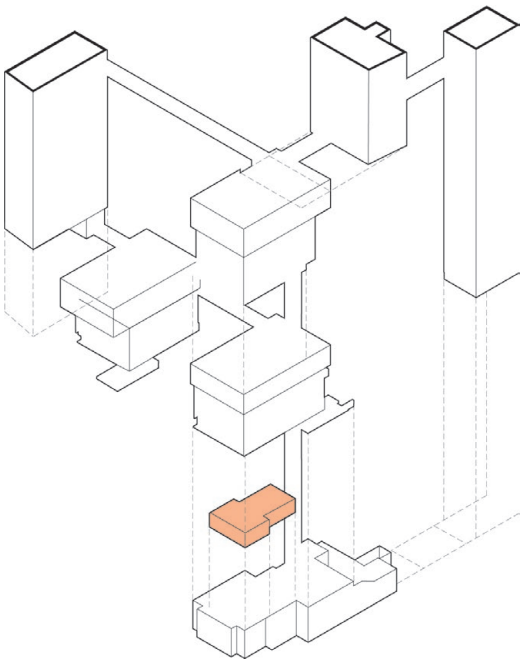


LEGEND

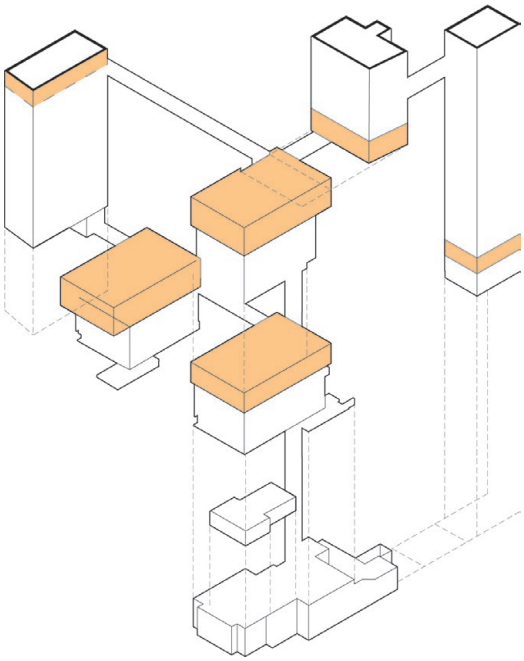
1. Institutional
2. Auditorium/ Theater
3. Recreational Facilities
4. Child Care
5. Community Complex
6. Residential



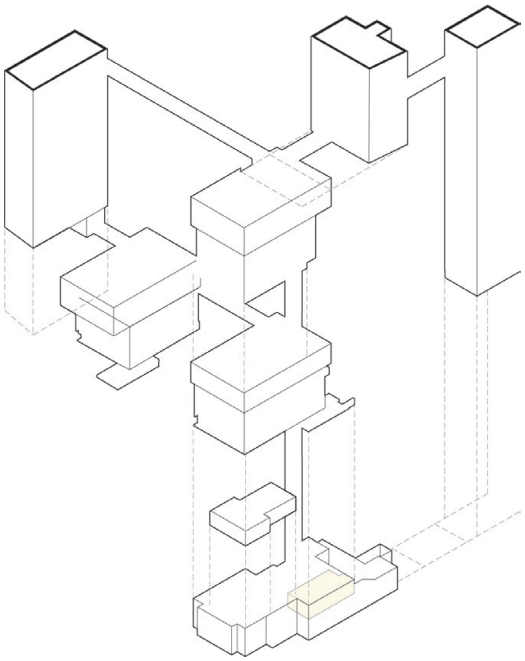
1. Institutional



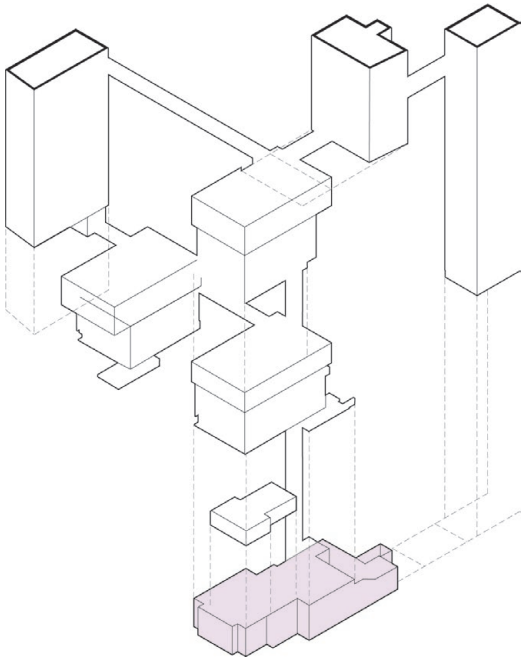
2. Auditorium/Theater



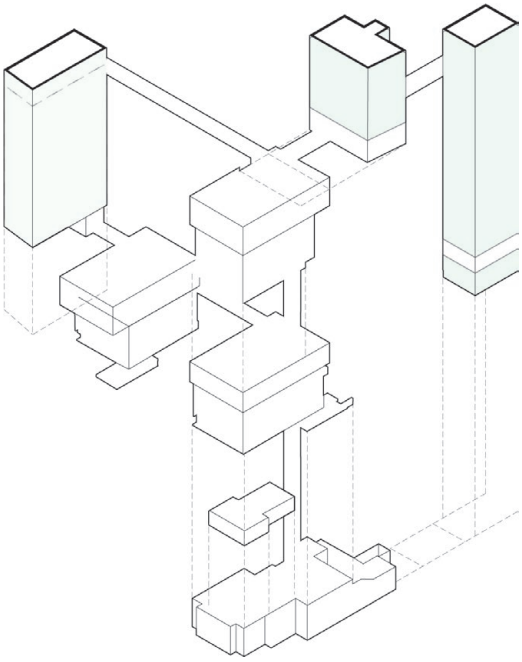
3. Recreational Facilities



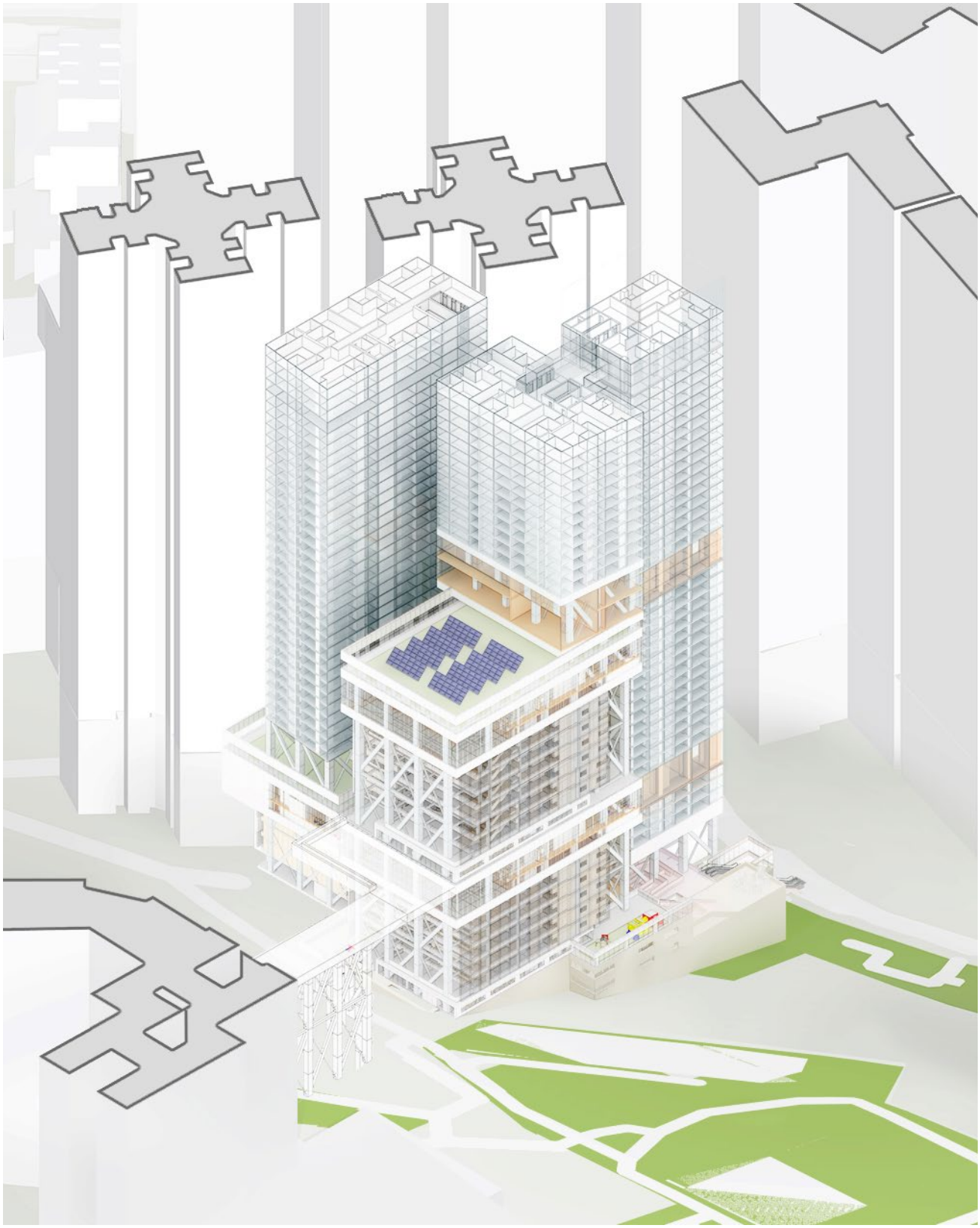
4. Child Care



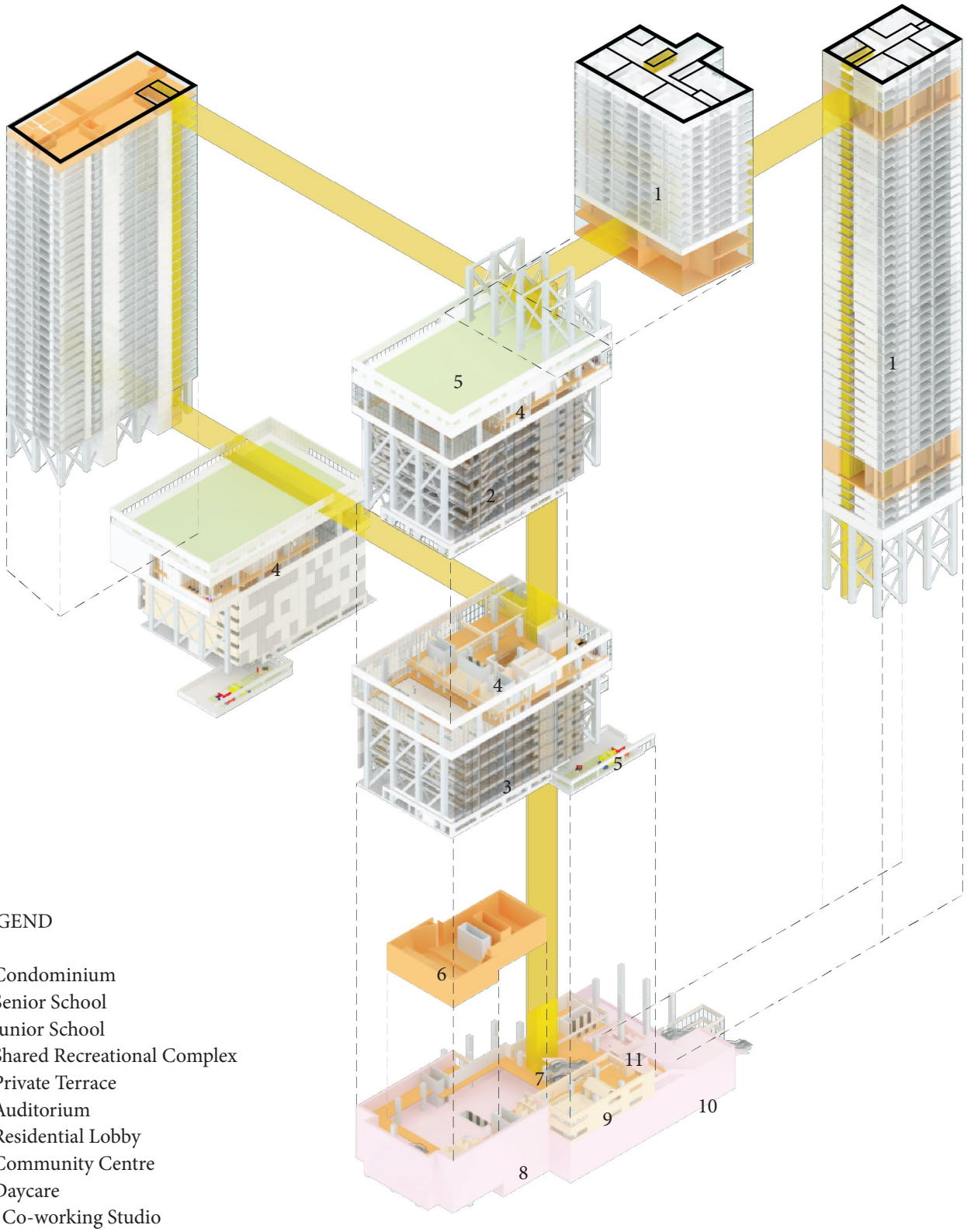
5. Community



6. Residential



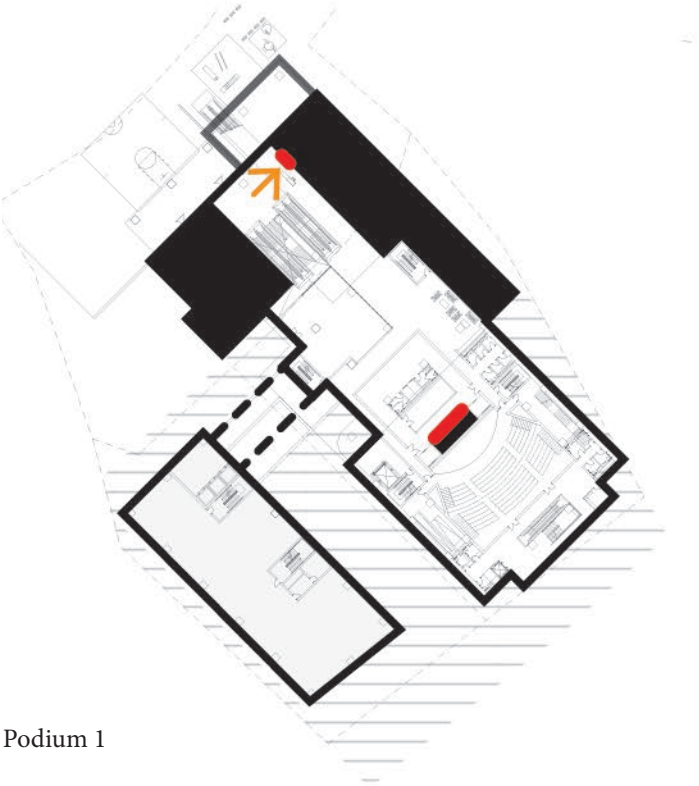
3D exploded diagram of the full complex. Yellow strips indicate where vertical and horizontal pedestrian connections occurs within the development.



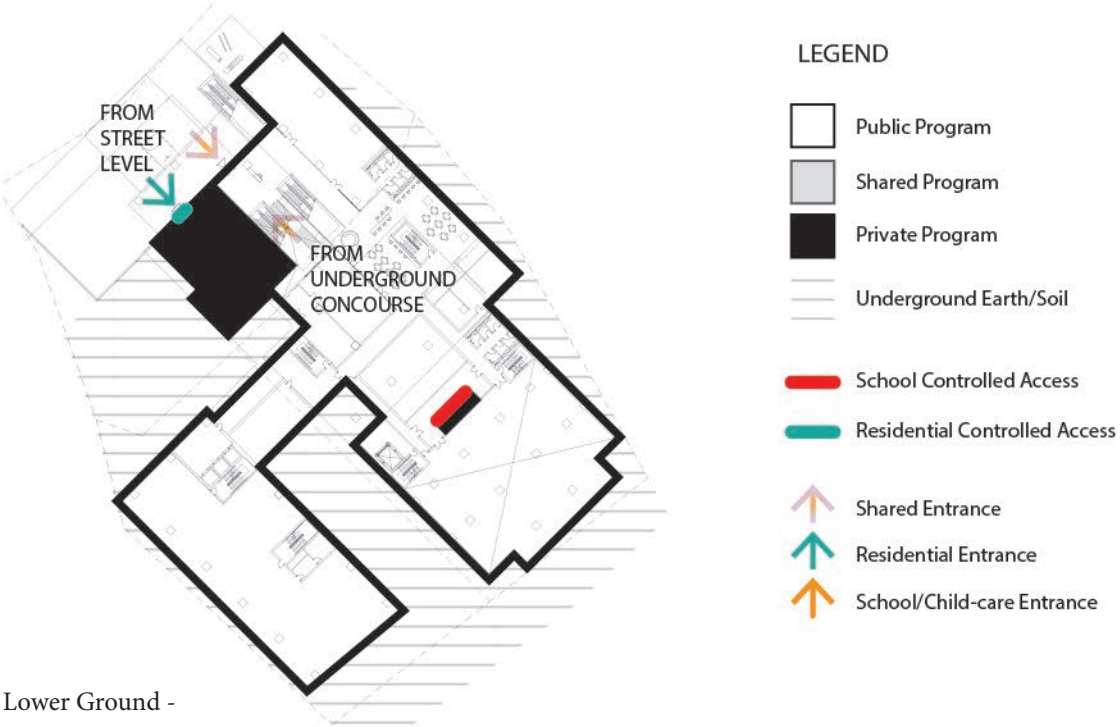
LEGEND

1. Condominium
2. Senior School
3. Junior School
4. Shared Recreational Complex
5. Private Terrace
6. Auditorium
7. Residential Lobby
8. Community Centre
9. Daycare
10. Co-working Studio
11. Outdoor Public Play/ Fitness Zone

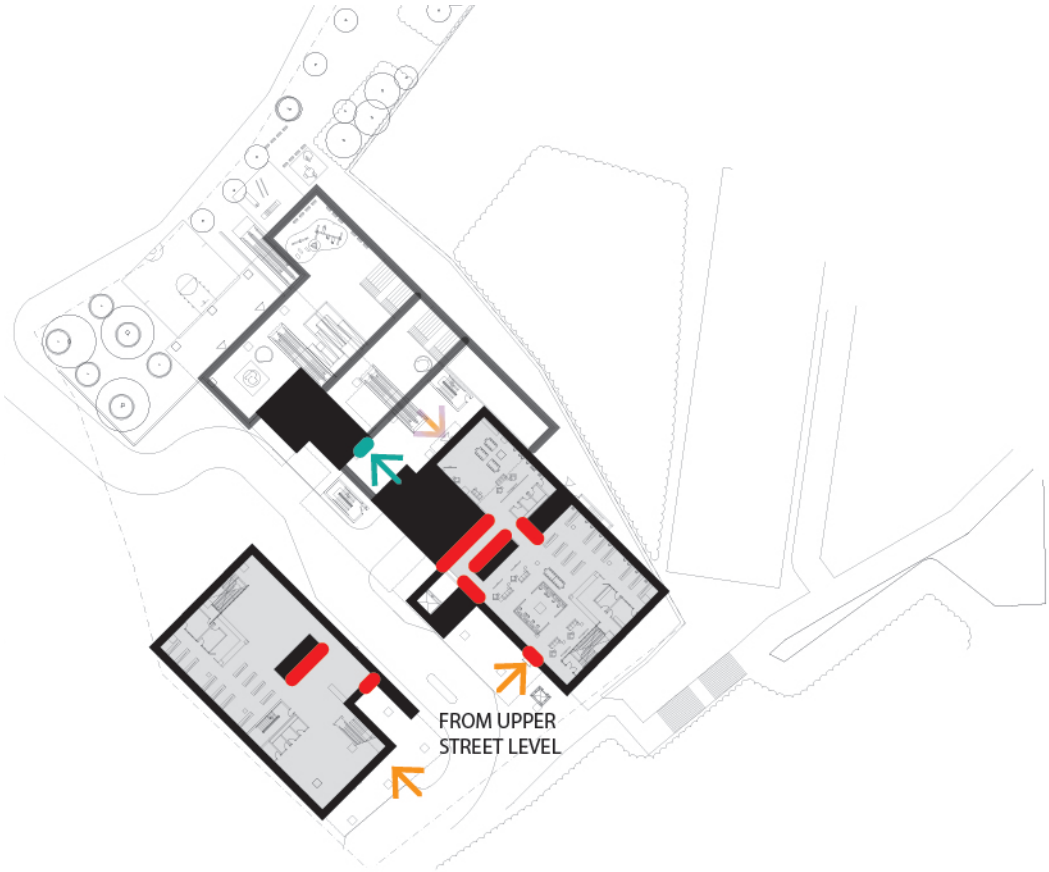
Public and Shared Facilities Access and Control



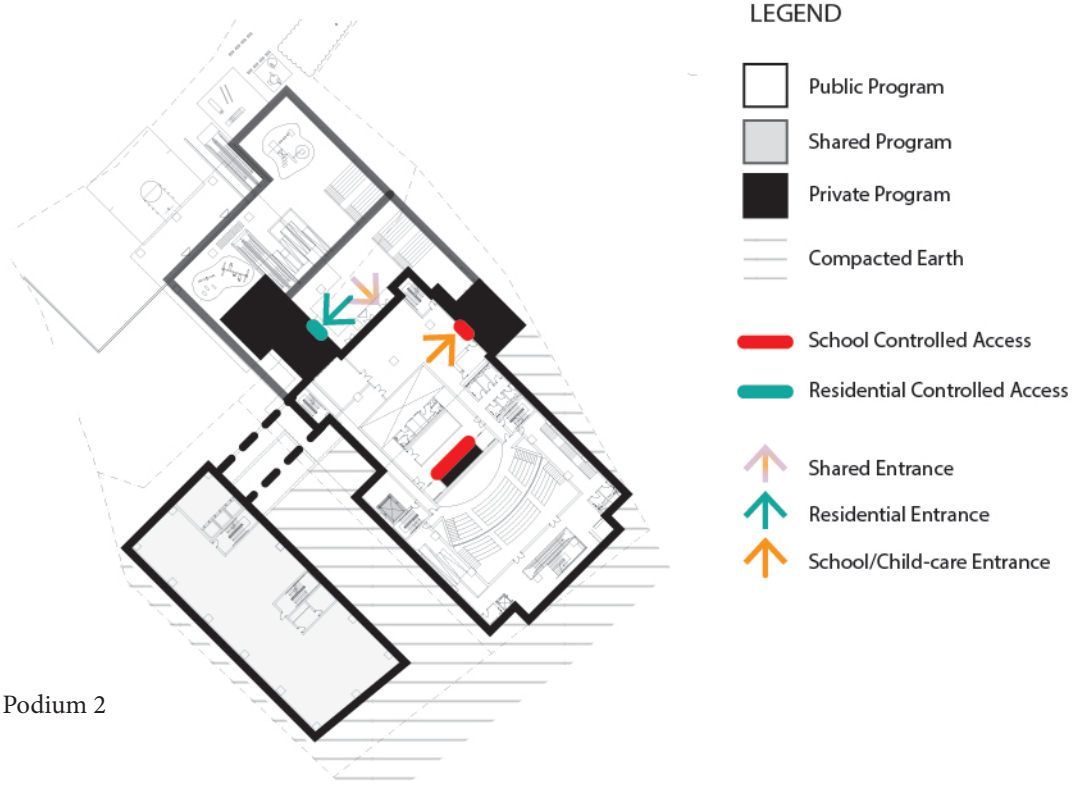
Podium 1



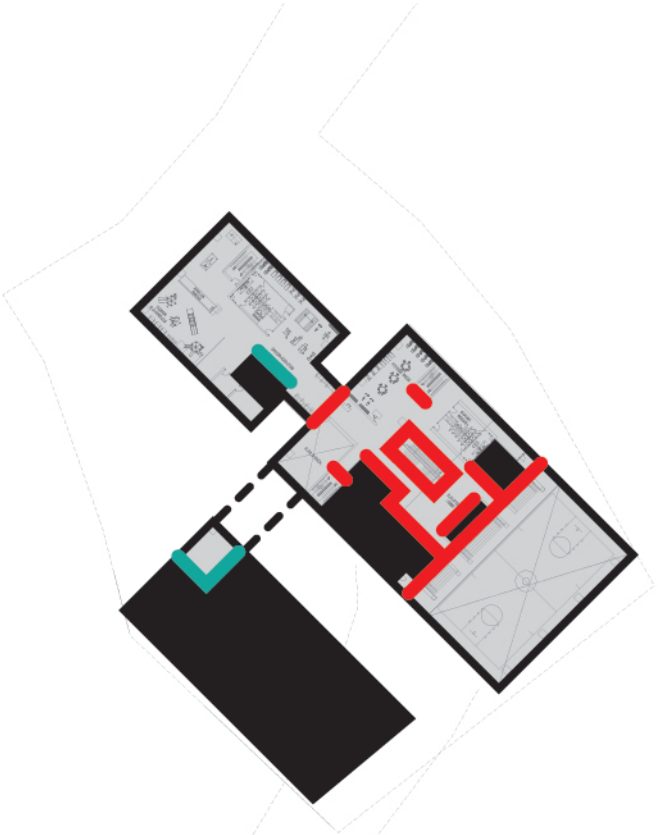
Lower Ground -
Community complex and Residential off-the-street Entrance



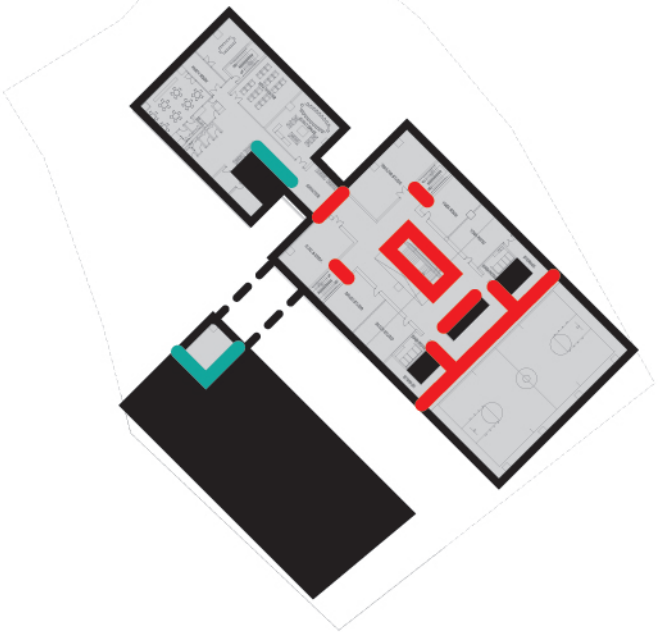
Podium 3/ Upper Ground -
School Entrances



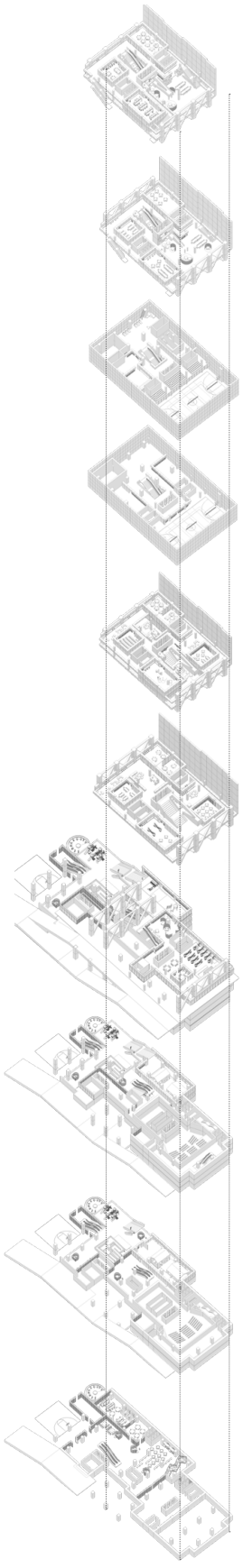
Podium 2



Upper Gym



Lower Gym



Secondary School - Typical Upper Level

Secondary School - Typical Lower Level

Upper Gym

Lower Gym

Primary School - Typical Upper Level

Primary School - Typical Lower Level

Podium 3/ Upper Ground -
School Entrances

Podium 2

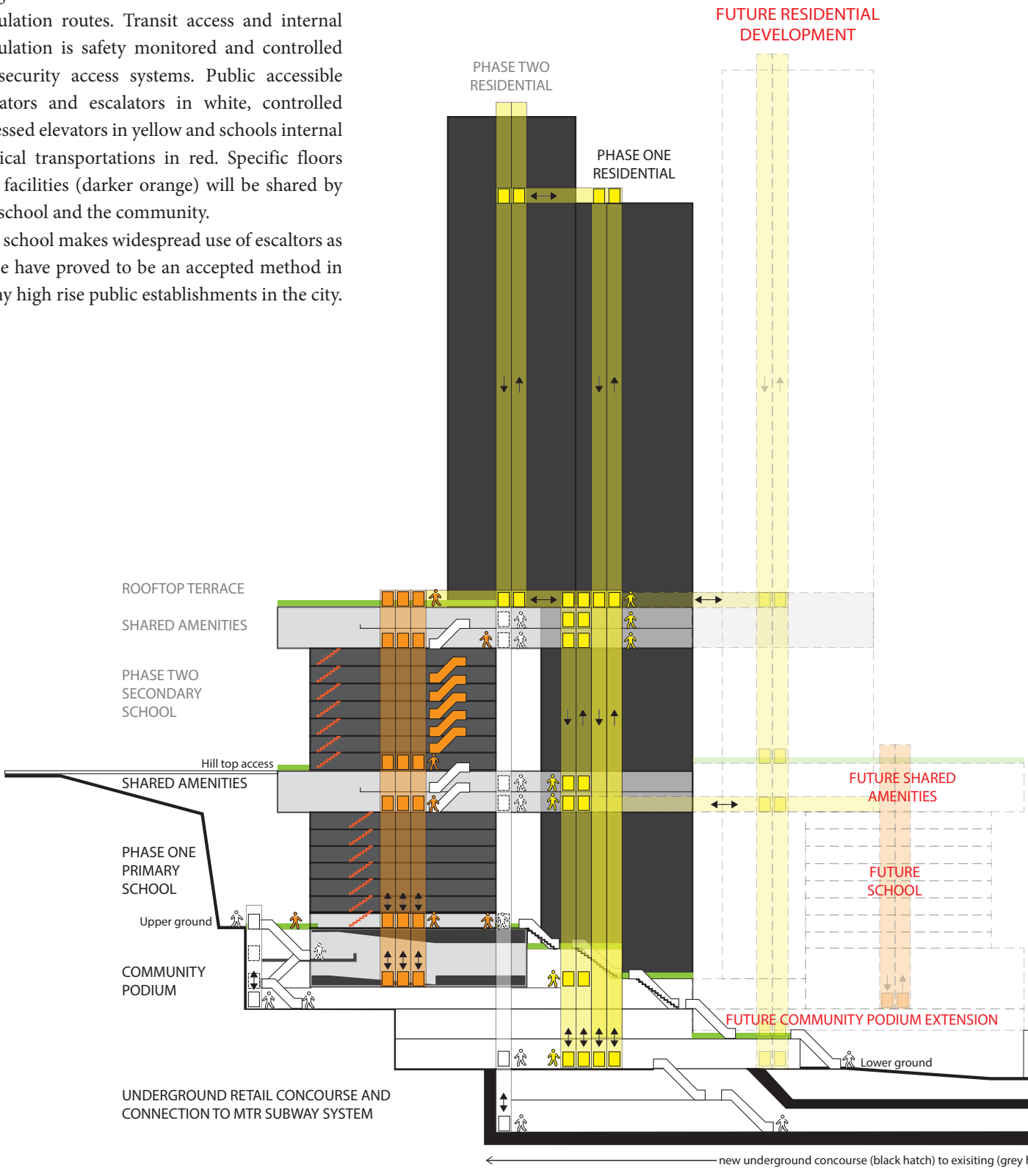
Podium 1

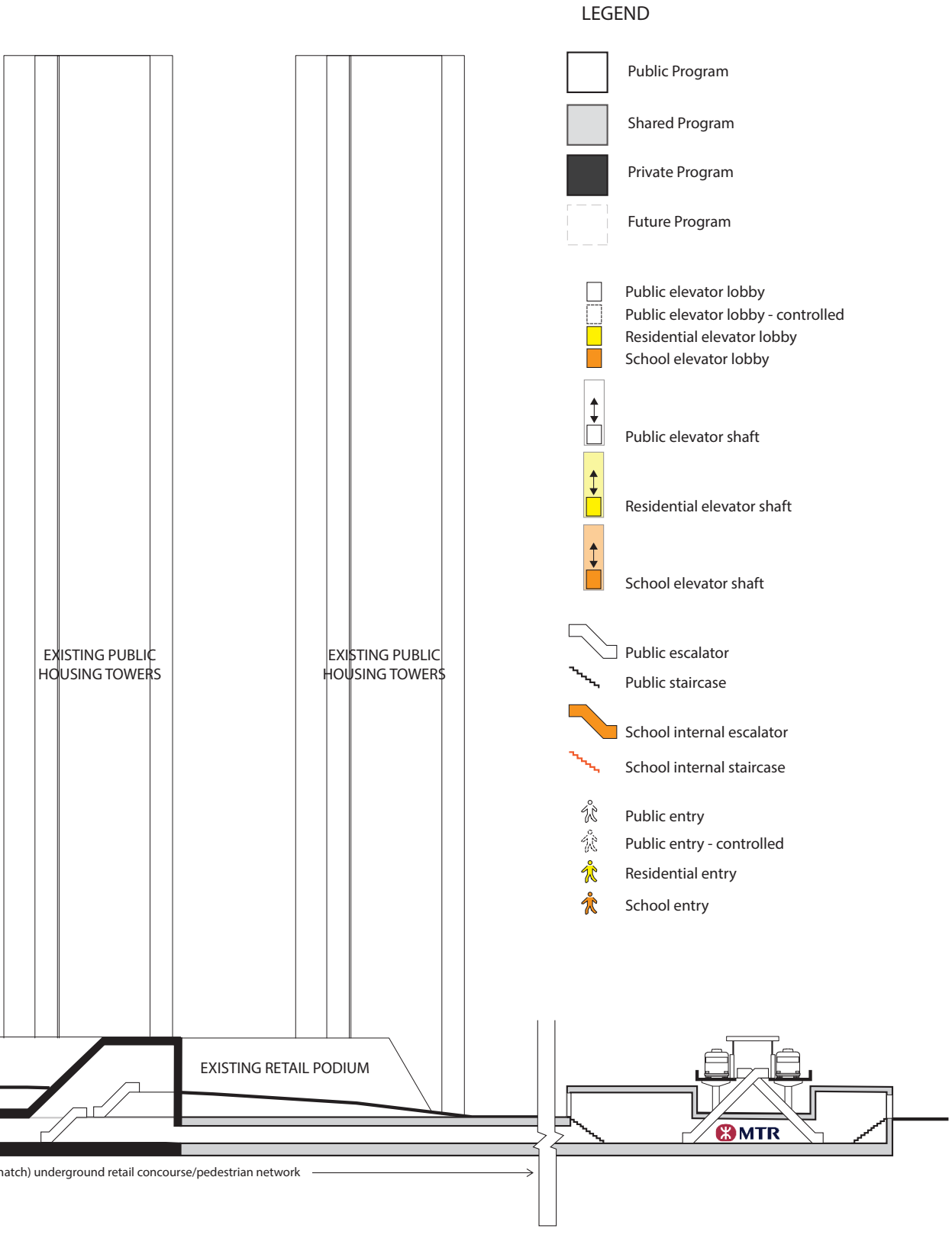
Lower Ground -
Community complex and Residential off-the-street Entrance

Sectional diagram

Program distribution and main vertical circulation routes. Transit access and internal circulation is safety monitored and controlled by security access systems. Public accessible elevators and escalators in white, controlled accessed elevators in yellow and schools internal vertical transportations in red. Specific floors and facilities (darker orange) will be shared by the school and the community.

The school makes widespread use of escaltors as these have proved to be an accepted method in many high rise public establishments in the city.




LEGEND
Public Program
Shared Program
Private Program
Future Program
Public elevator lobby
Public elevator lobby - controlled
Residential elevator lobby
School elevator lobby
Public elevator shaft
Residential elevator shaft
School elevator shaft
Public escalator
Public staircase
School internal escalator
School internal staircase
Public entry
Public entry - controlled
Residential entry
School entry
EXISTING PUBLIC HOUSING TOWERS
EXISTING PUBLIC HOUSING TOWERS
EXISTING RETAIL PODIUM
MTR
natch) underground retail concourse/pedestrian network

Block Type: School

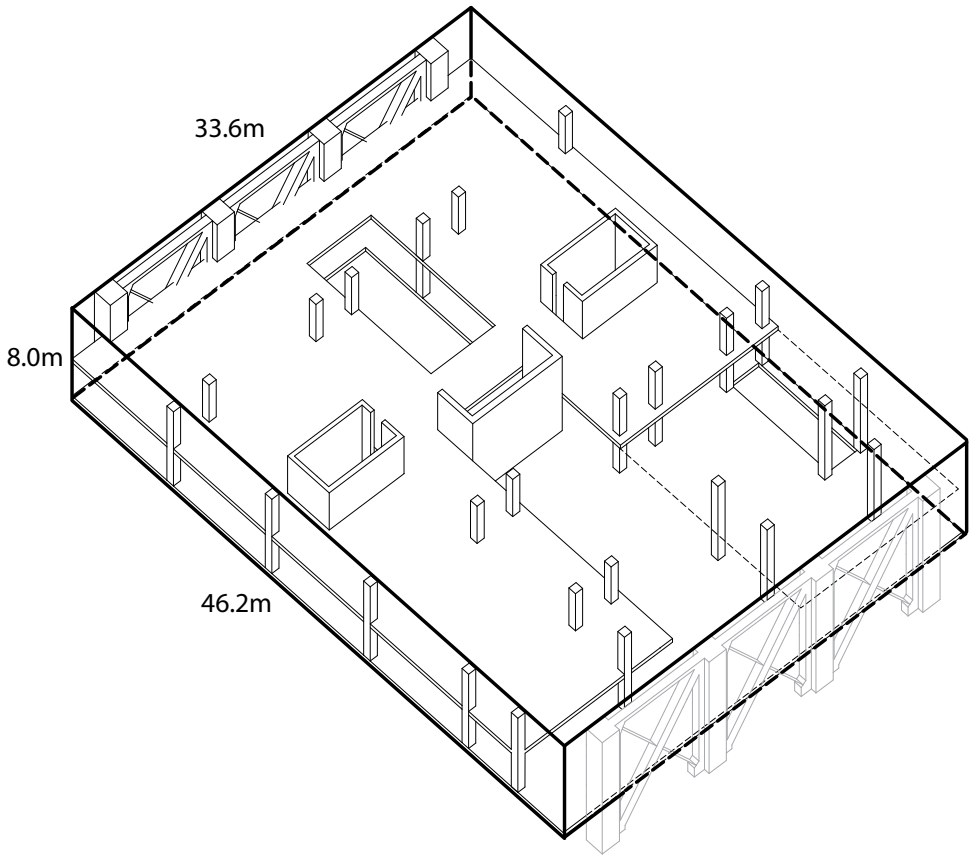
Spatial Configuration

9m by 9m Grid

The structural grid of the basic school block module is designed to be highly versatile and flexible. Base on research of classroom sizes and regulatory requirements, the 9m by 9m horizontal dimension provides the most adequate basis for an enclosed learning space. Furthermore, 9m wide structural span allows for a potential parking structure to be incorporated in the base levels (when required), such configuration allows for 3 parking spots in each bay.

3m Hallways

Major circulation hallways (E-W direction) are kept at 3m wide to promote an open learning environment integrated in circulation spaces.



Two-Storey Hub: Creating double height community to foster inter-level connections and sharing of resources.

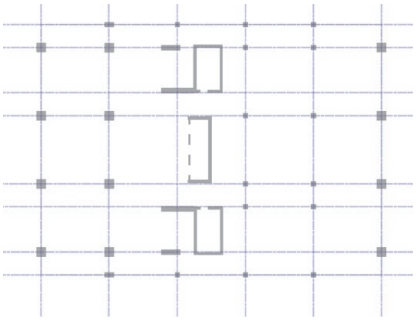
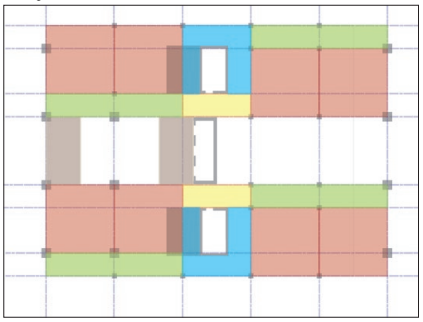
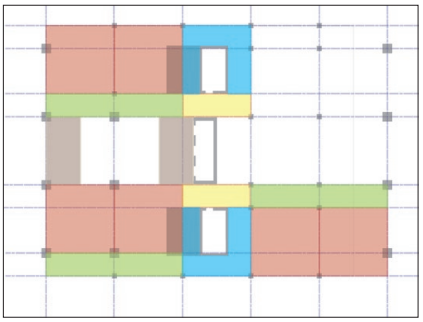


Figure 163 Main Structural Component

Prefabricated Floor Plate Modules:

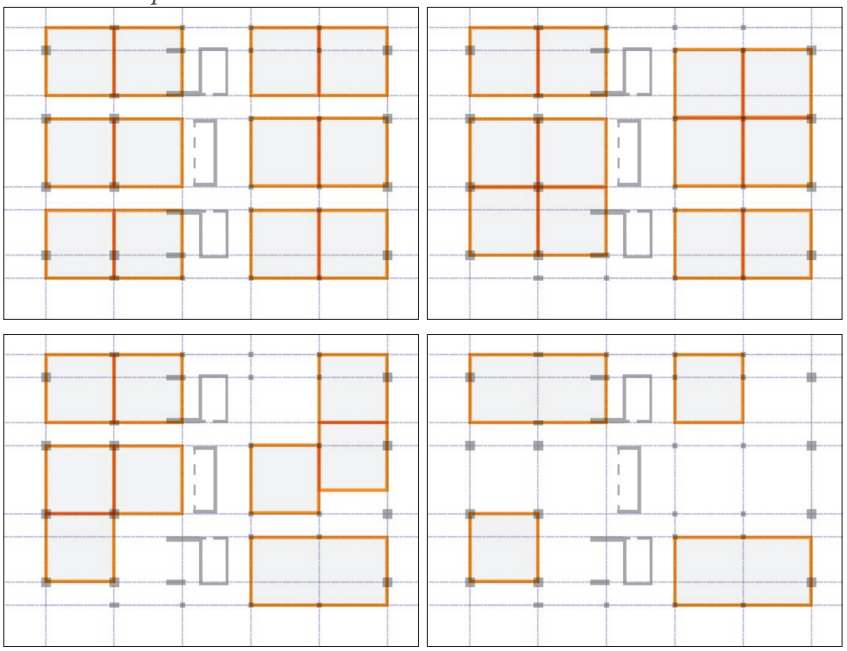


Primary School Configuration - smaller double height openings for better vertical circulation control over dynamic activities.



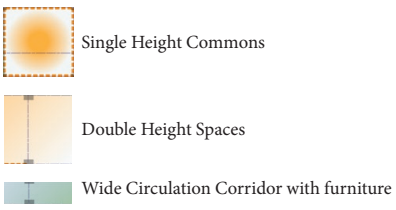
Secondary School Configuration - larger double openings to allow for diverse activities and multiple vertical circulation paths.

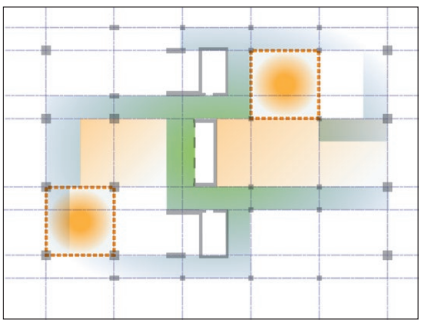
Enclosed Compartments



Enclosed learning compartment can be arranged in different configurations.

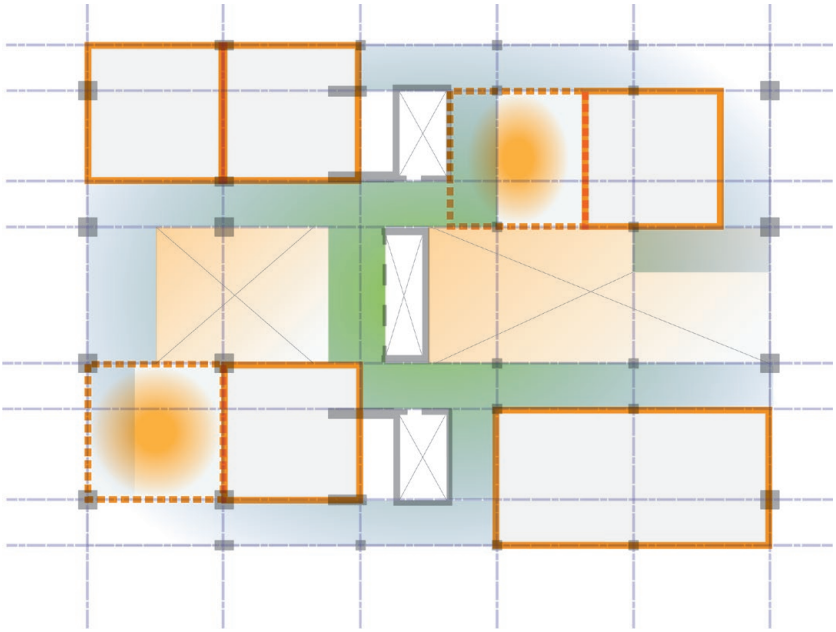
Open Learning Types





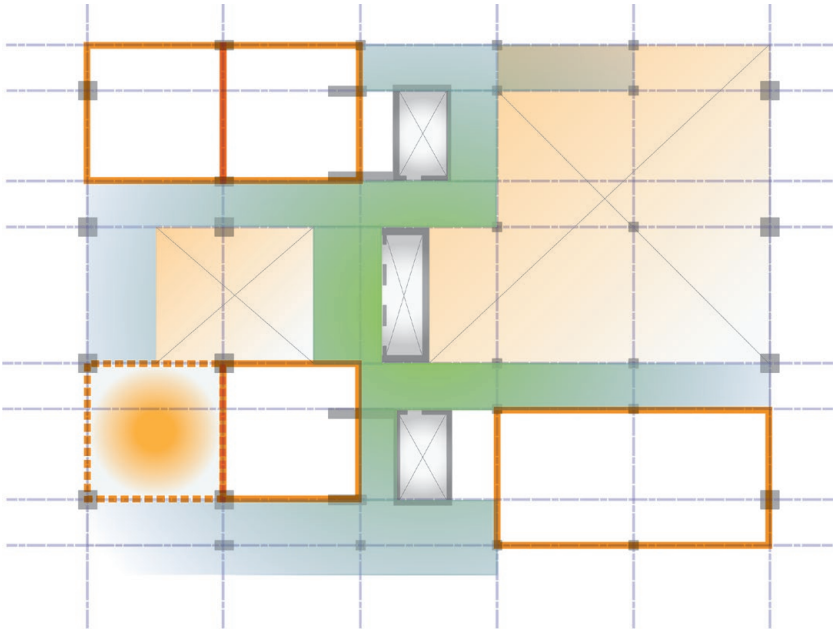
Distribution of 3 types of open learning space.

Primary School Scheme



Open learning spaces combined with enclosed learning modules.

Secondary School Scheme



Open learning spaces combined with enclosed learning modules.

Combined Learning

The Three types of learning spaces identified to be crucial to the 21st century learning environment are:

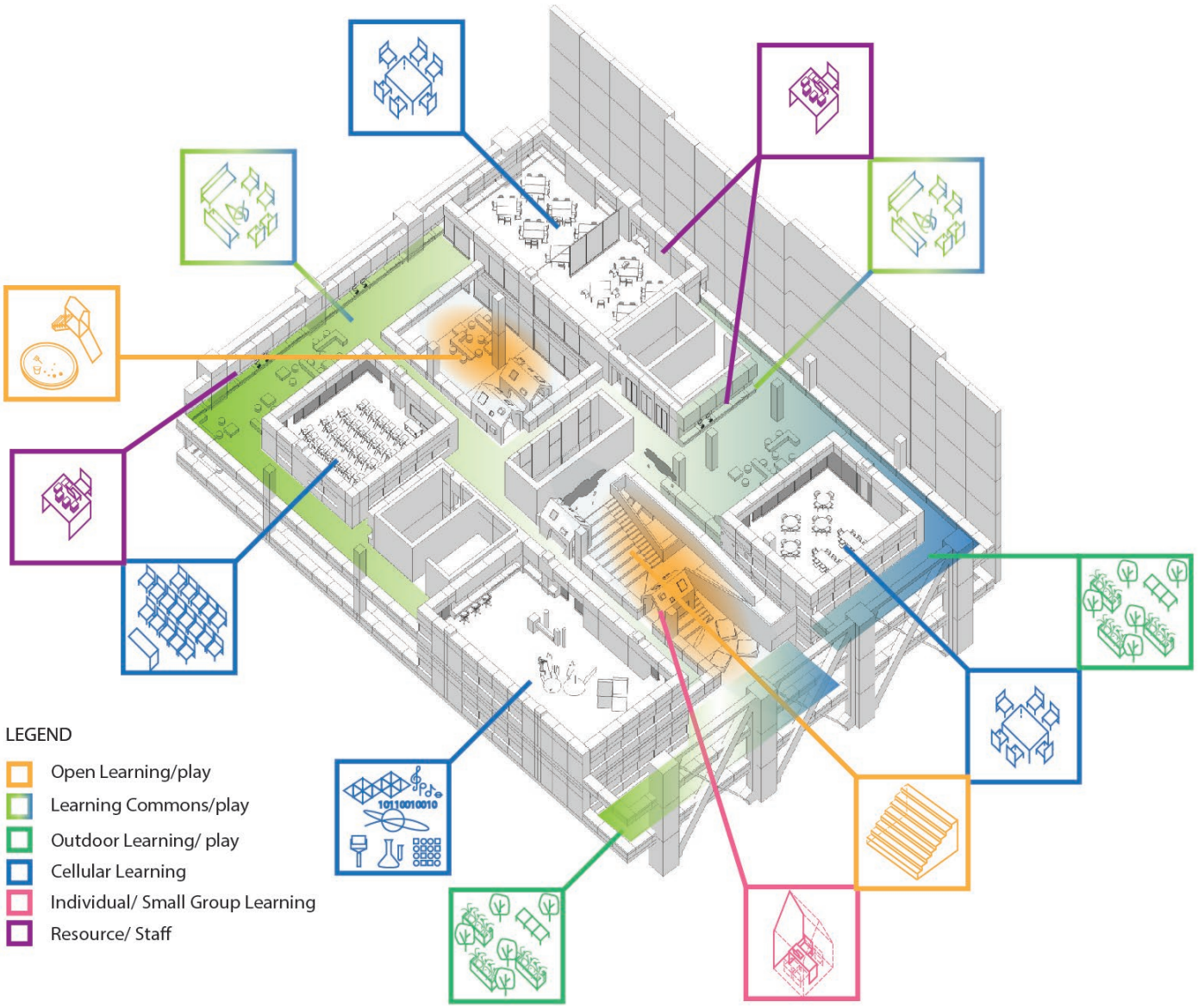
- Enclosed Learning Spaces: individual learning, small group discussions.
- Open/Shared Learning Spaces: dynamic, break-outs, collaborative activities, inter-subject projects, and presentations.
- Outdoor Learning Spaces: physical education, gardens, playgrounds, and messy-work areas.

The "Two-level module" is a combination of the environments outlined above. It is a sub-divided community within the school. Smaller communities within school encourages better communications and transparency between students and teachers making the school more suitable for an education that is now more geared towards individualization.

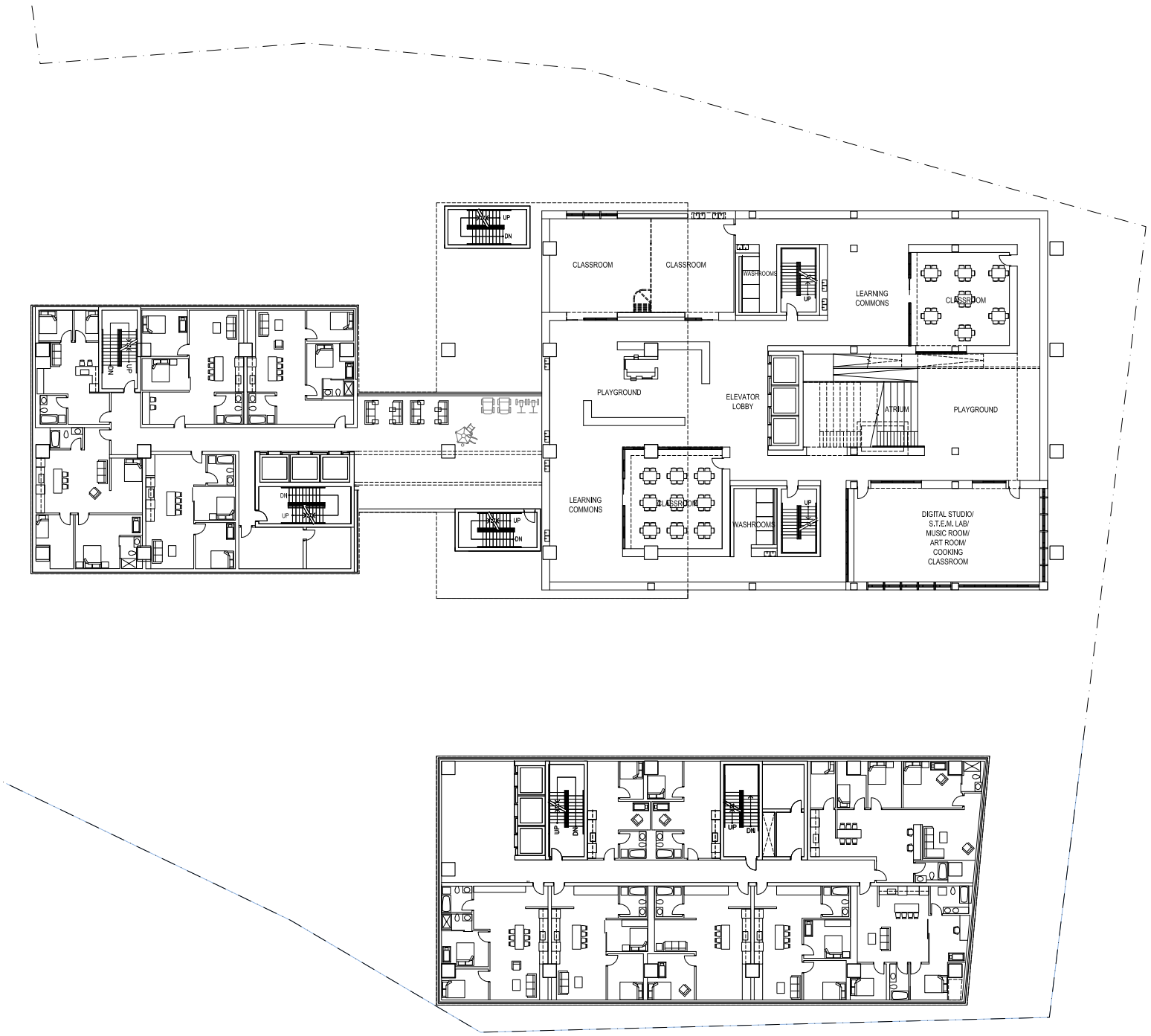
First, a diverse collaborative learning environment allows a wide-range of resources to be shared for a variety of pedagogical methods. Second, small intimate learning spaces equipped with a computer and other essential technological products provides and option for self-directed learning. Lastly, it is essential for children and youth to spend time in open-air environments engaging in physical activities and the natural environment.

Play – is an essential learning tool for students, especially for young children at the elementary levels. Safe and inspiring play places give them the freedom to explore the abilities and limits of their physical bodies while fostering creativity and problem-solving skills.

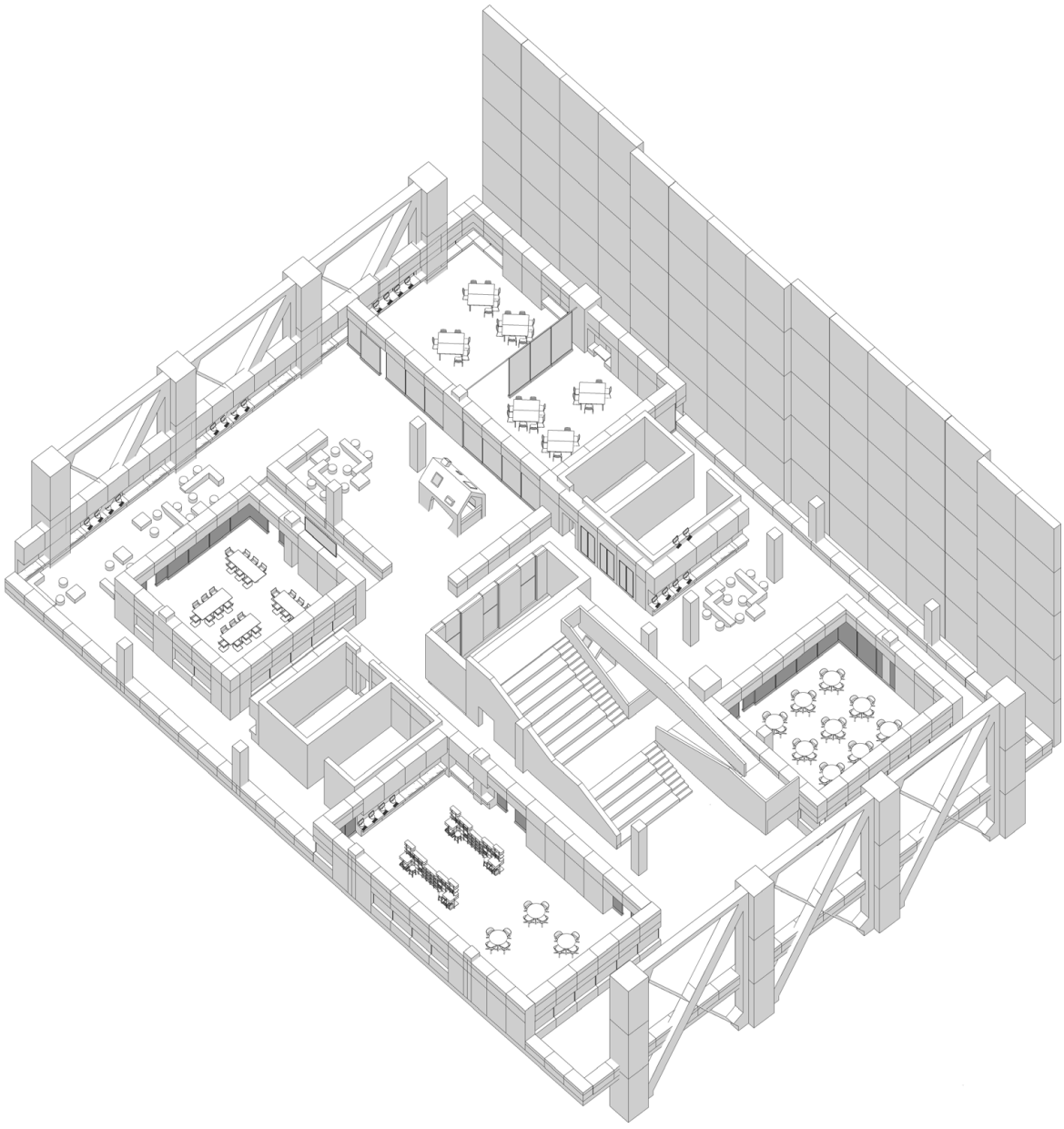
Block Type: School



Learning zones - junior school double storey module.

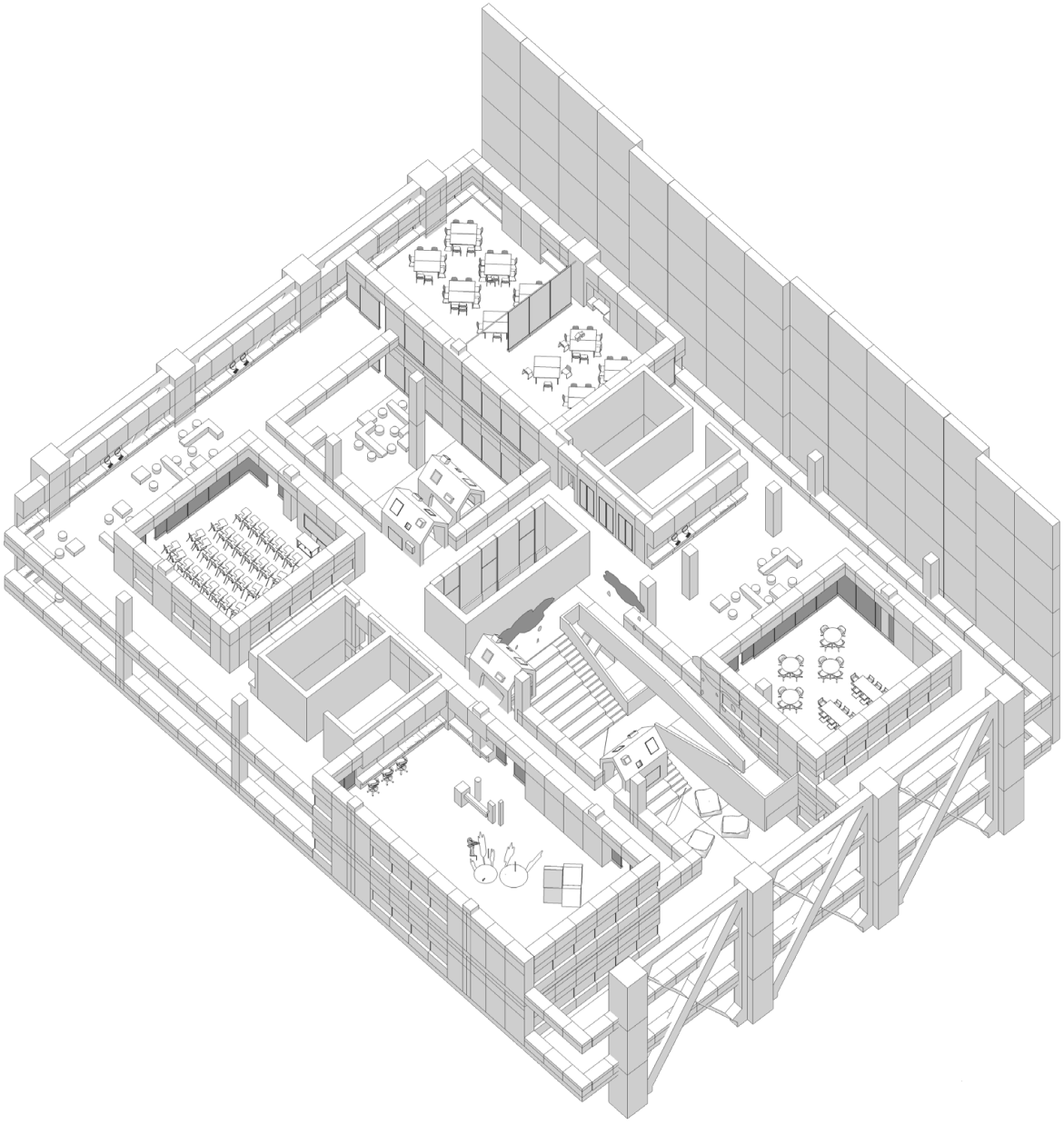


Tyipcal Floor Plan - junior school double storey module lower level.



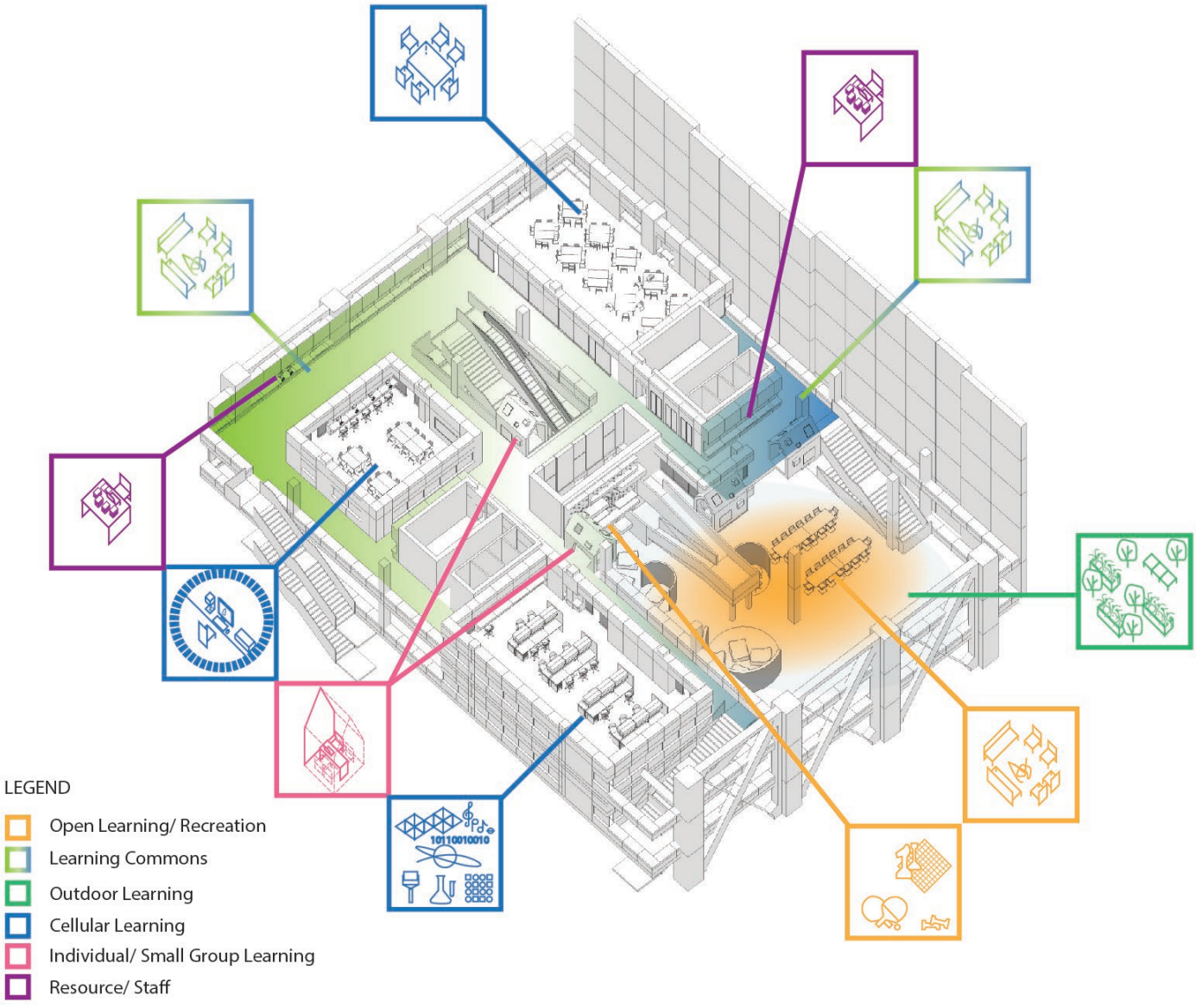
3D illustration of the junior school module lower level. Double storey indoor play grounds located at the center of the floor plate. Enclosed learning zones surrounded by wide corridors and learning commons.

"Watching a child makes it obvious that the development of his mind comes through his movements."
- Maria Montessori

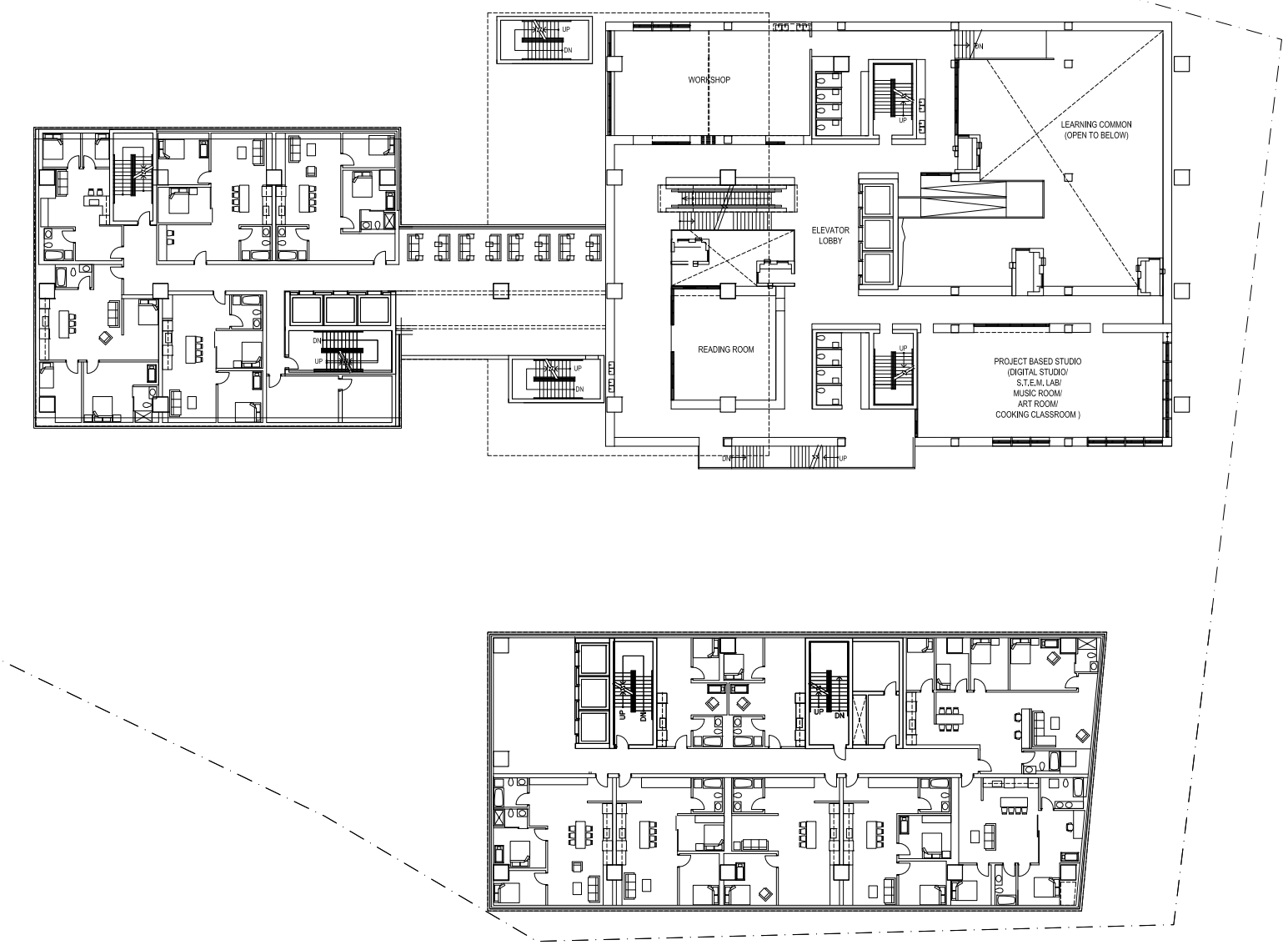


3D illustration of the junior school module upper level. Featuring assembly hall as an open staircase with accessible ramps and house shaped quite learning pods.

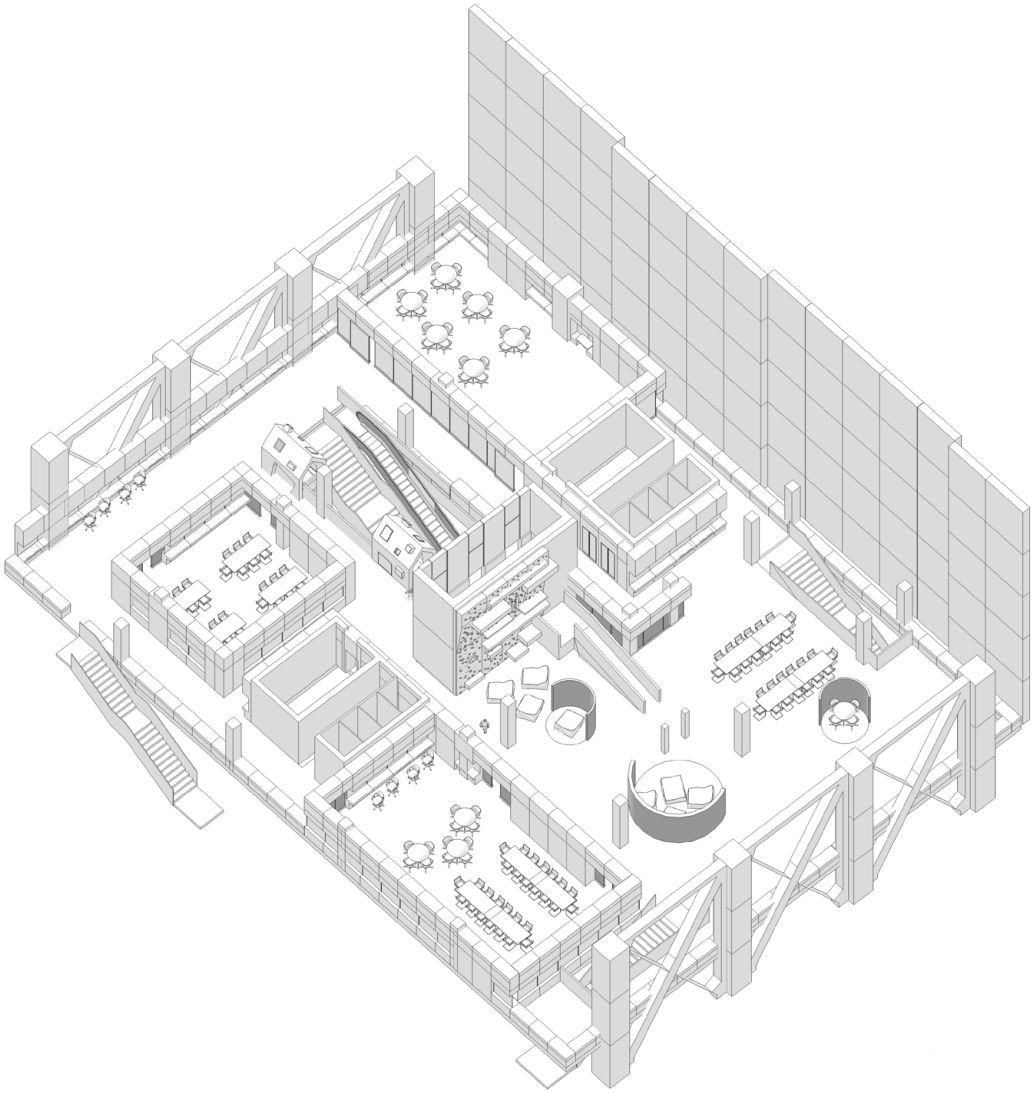
View of atrium spa.



Learning zones - senior school double storey module.

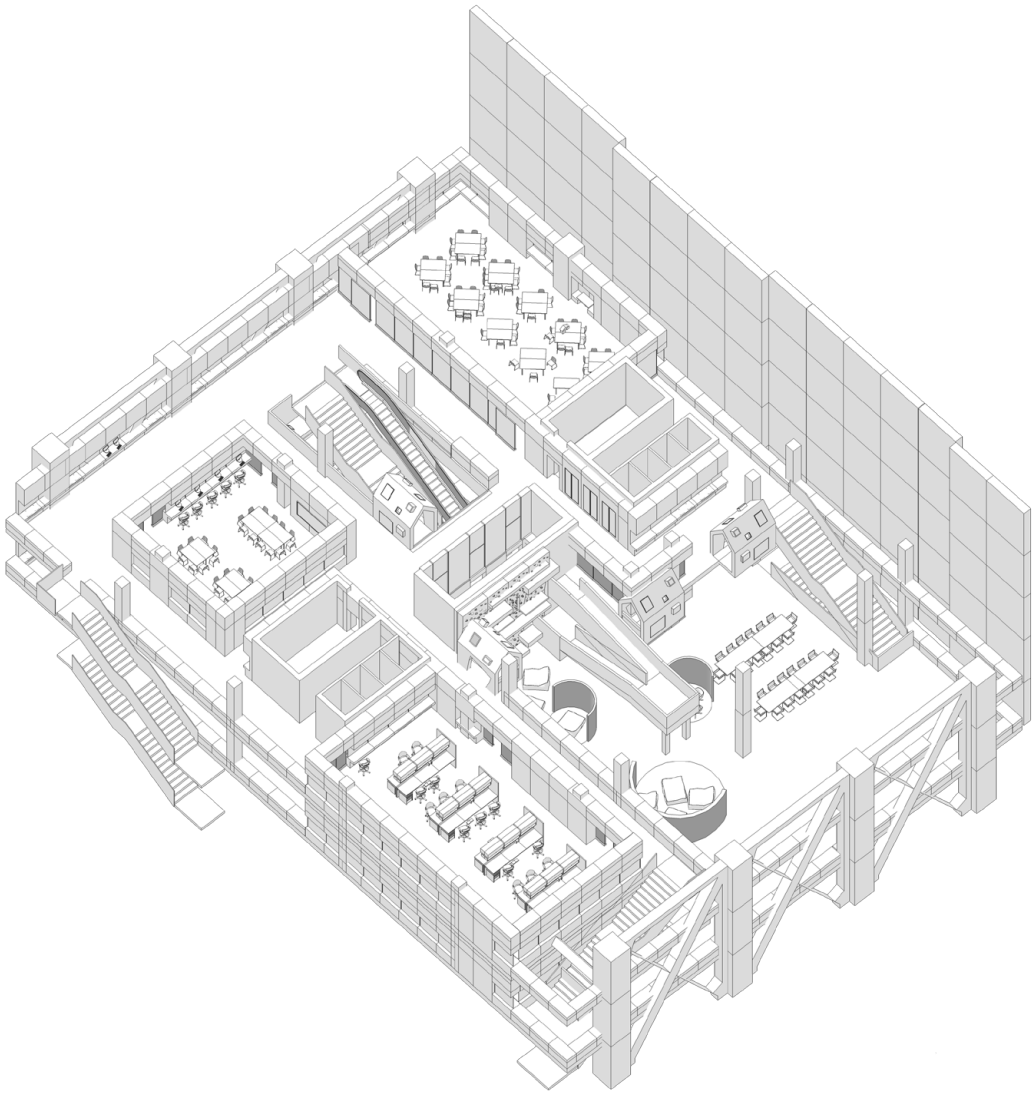


Tyipcal Floor Plan - senior school double storey module upper level.



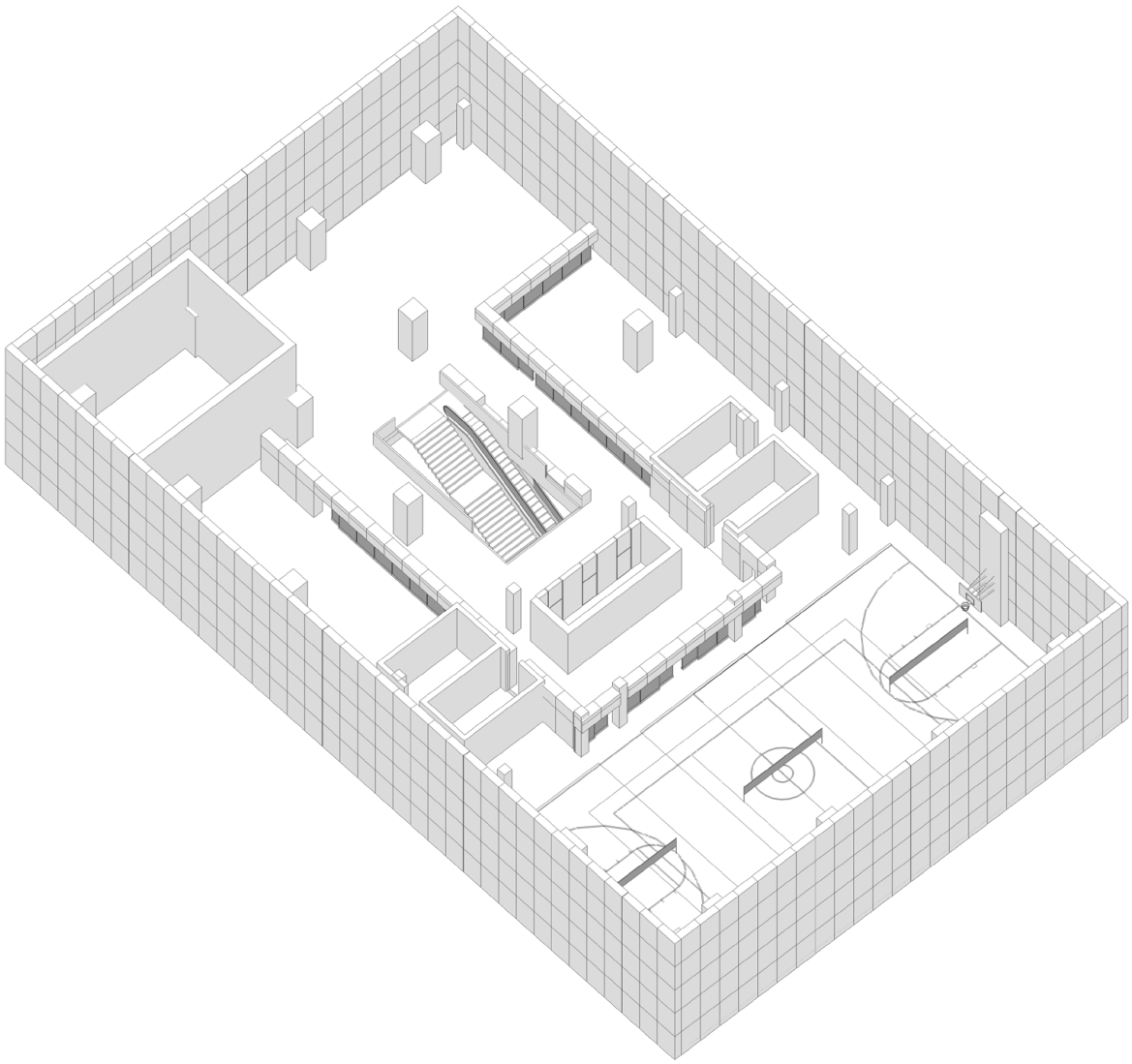
3D illustration of the senior school module lower level. Featuring learning commons with climbing wall and accessible ramps. Additional staircases are located near the exterior walls for more efficient inter-levels circulation.

View of a double storey learning common.

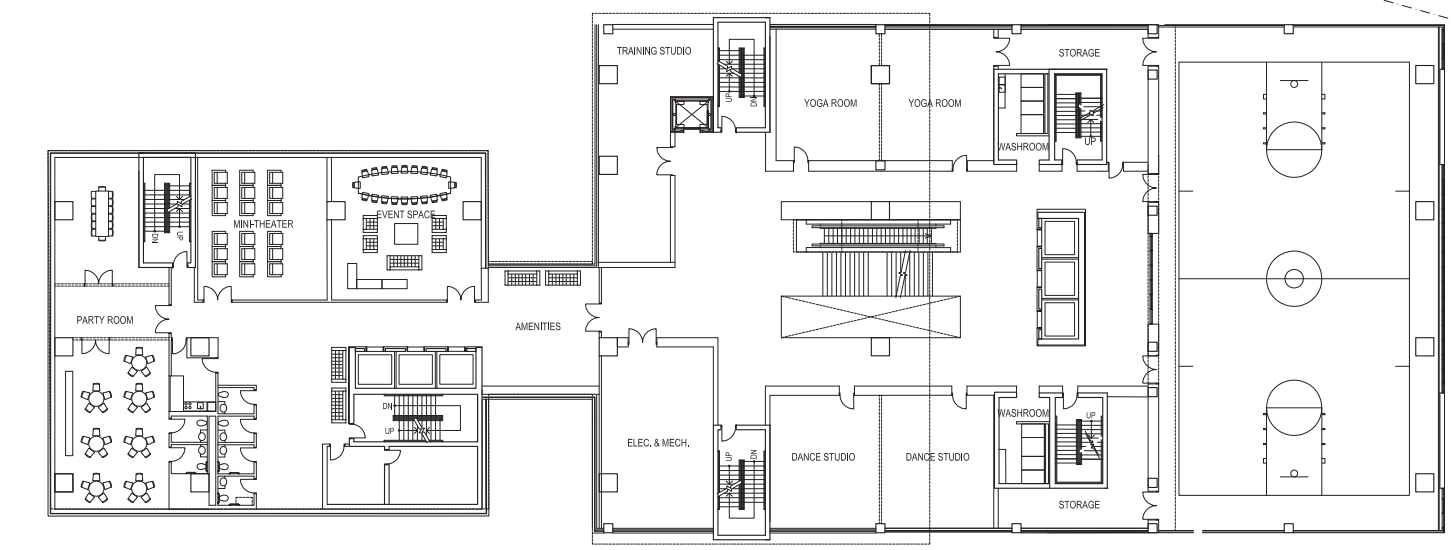


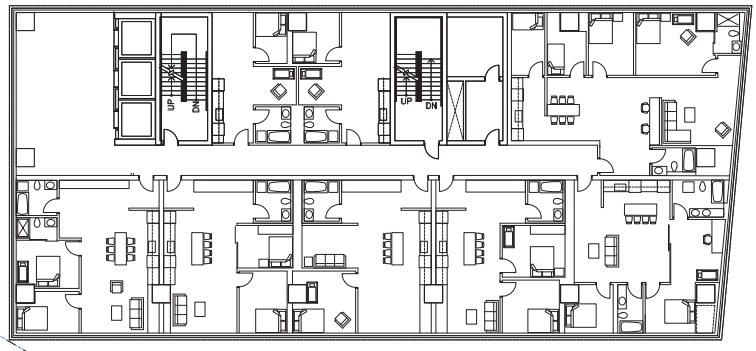
3D illustration of the junior school module upper level. Double storey learning commons with enclosed (house shaped) and semi-enclosed (crecent shaped partitioned spaces) group study learning zones.

View of a learning common beside a classroom.

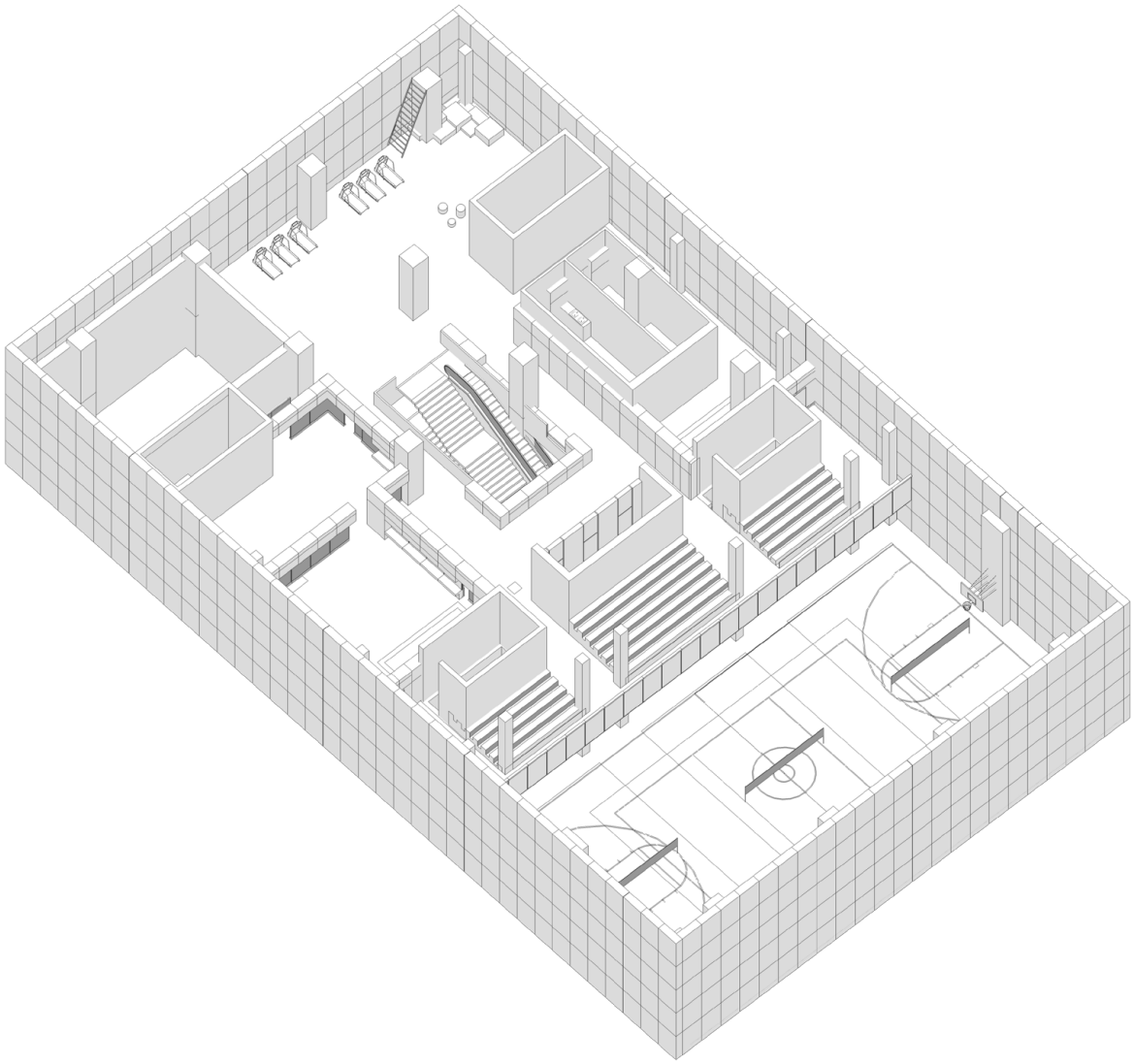


Lower level of the gymnasium and exercise rooms.

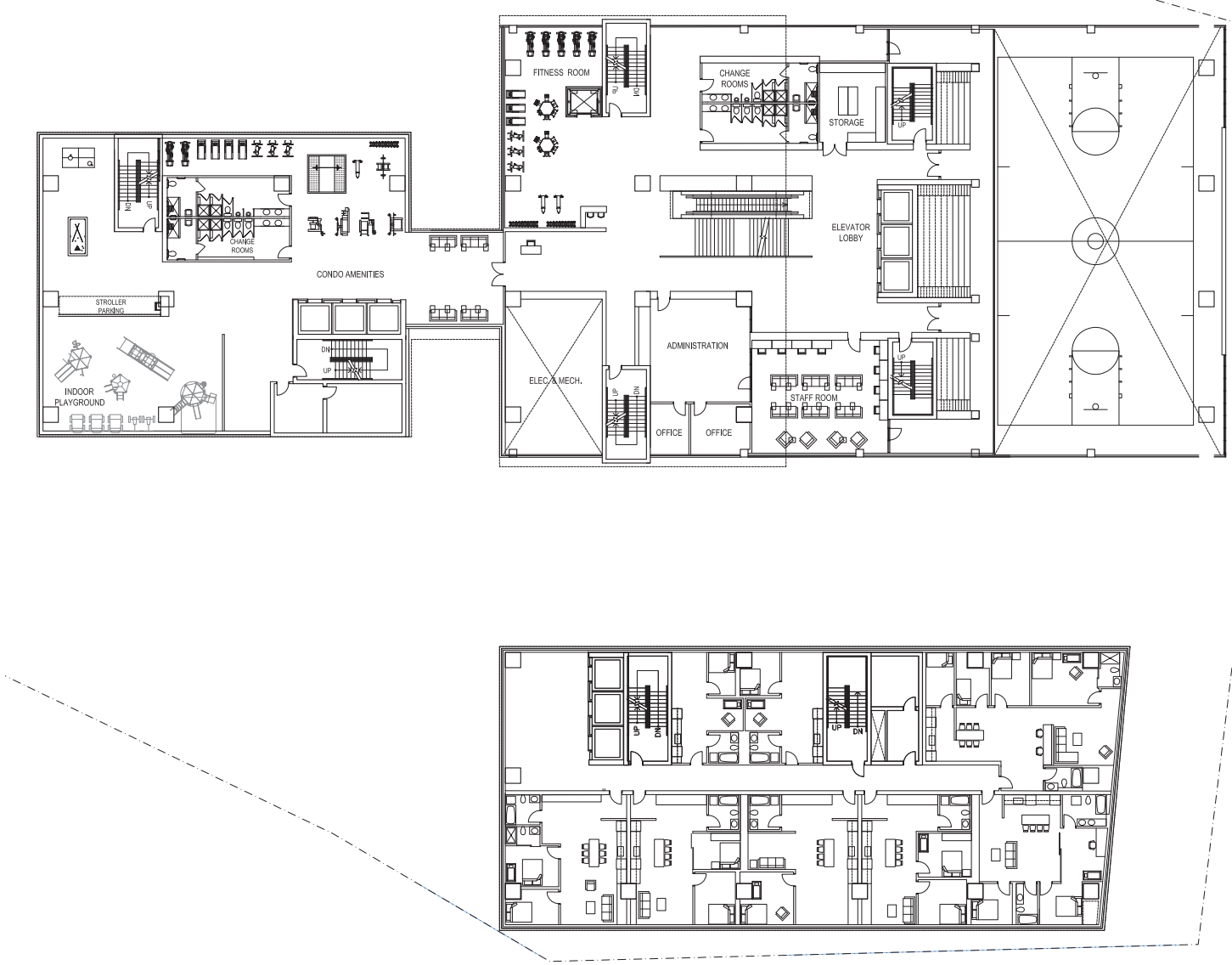




Floor Plan - double storey gymnasium module lower level. Controlled access is provided at this level to connect with condominium amenities.

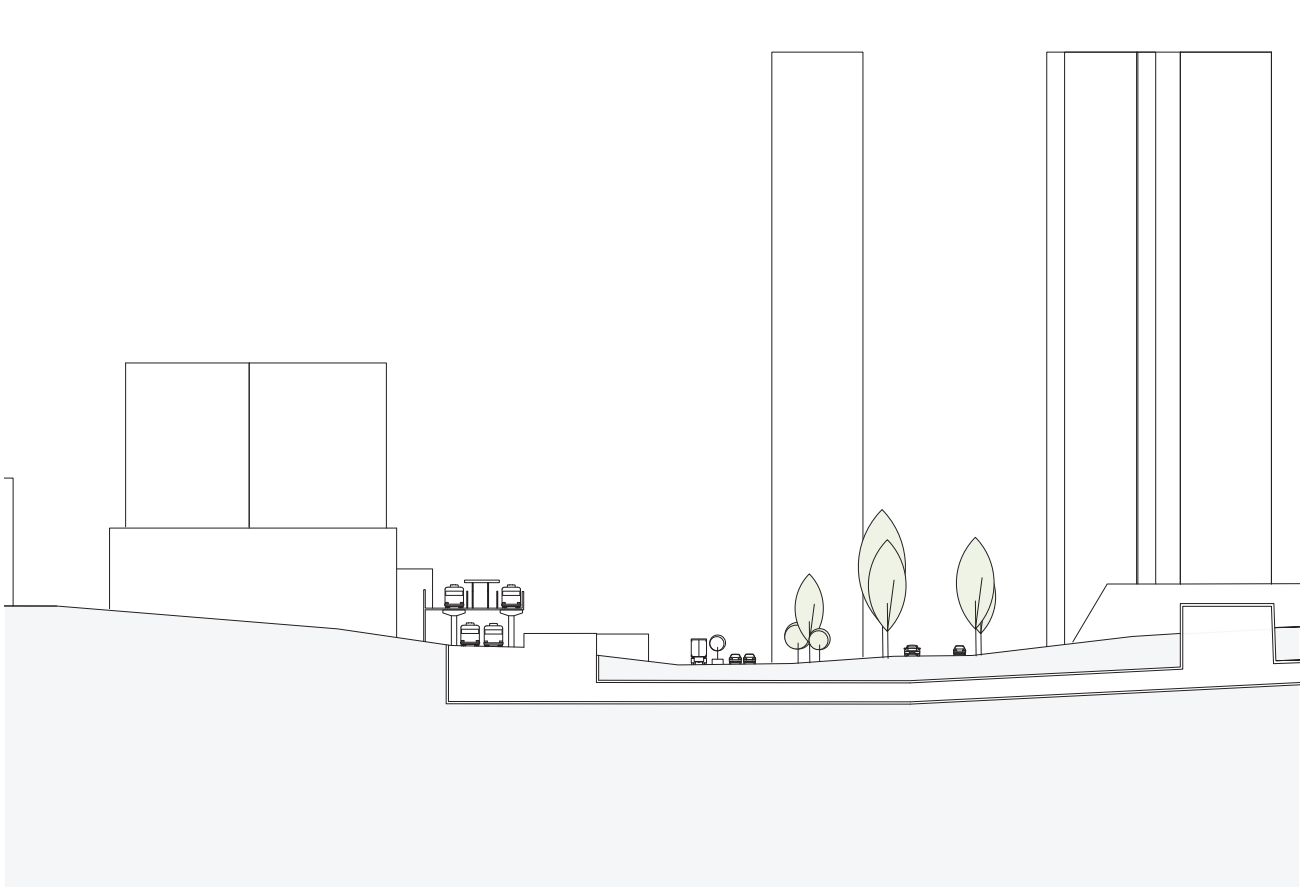


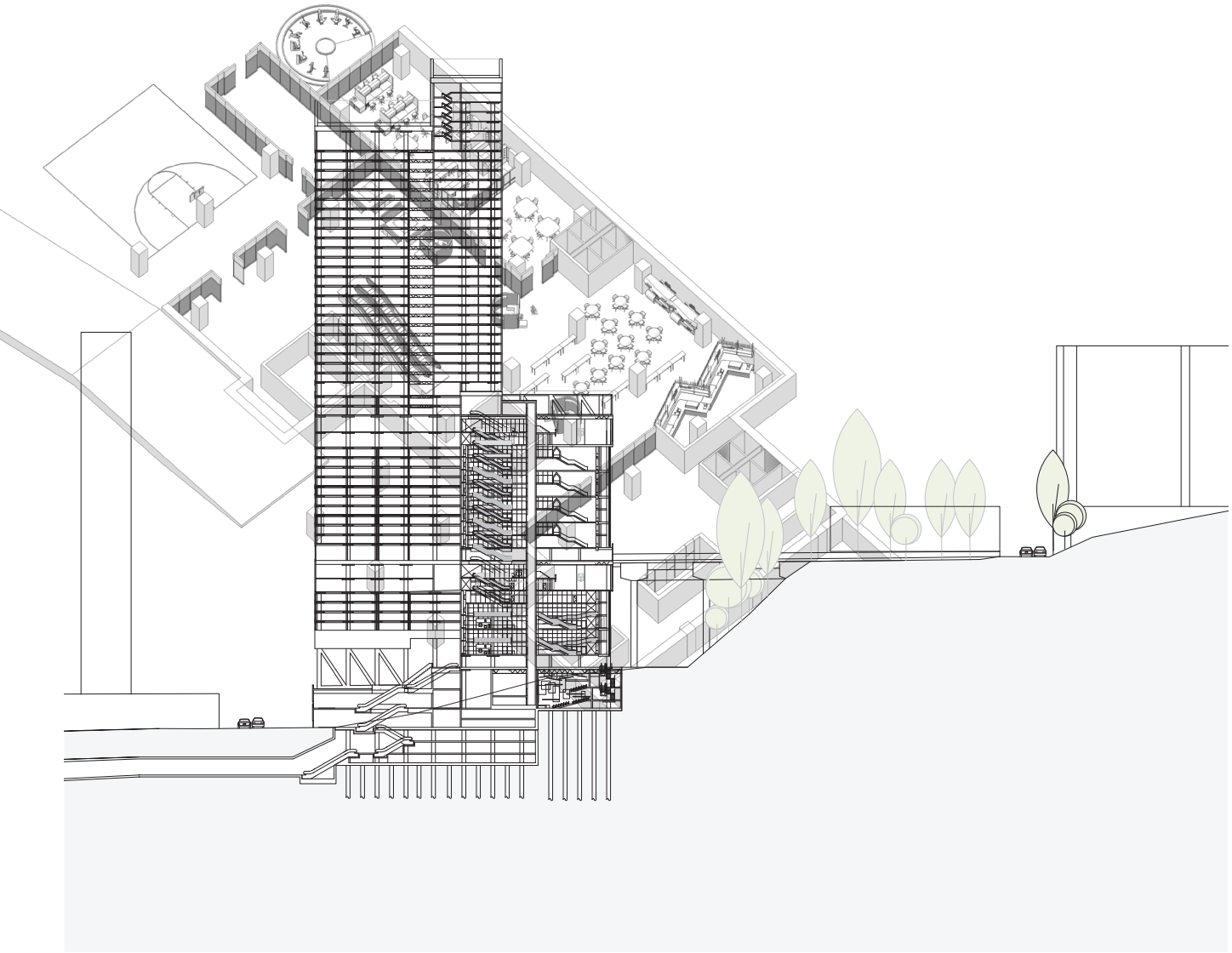
Upper level of the gymnasium module - retractable benches, change rooms and fitness training spaces.



Floor Plan - double storey gymnasium module upper level. Controlled access is also provided at this level to connect with condominium amenities.

Perspective of the full size gymnasium





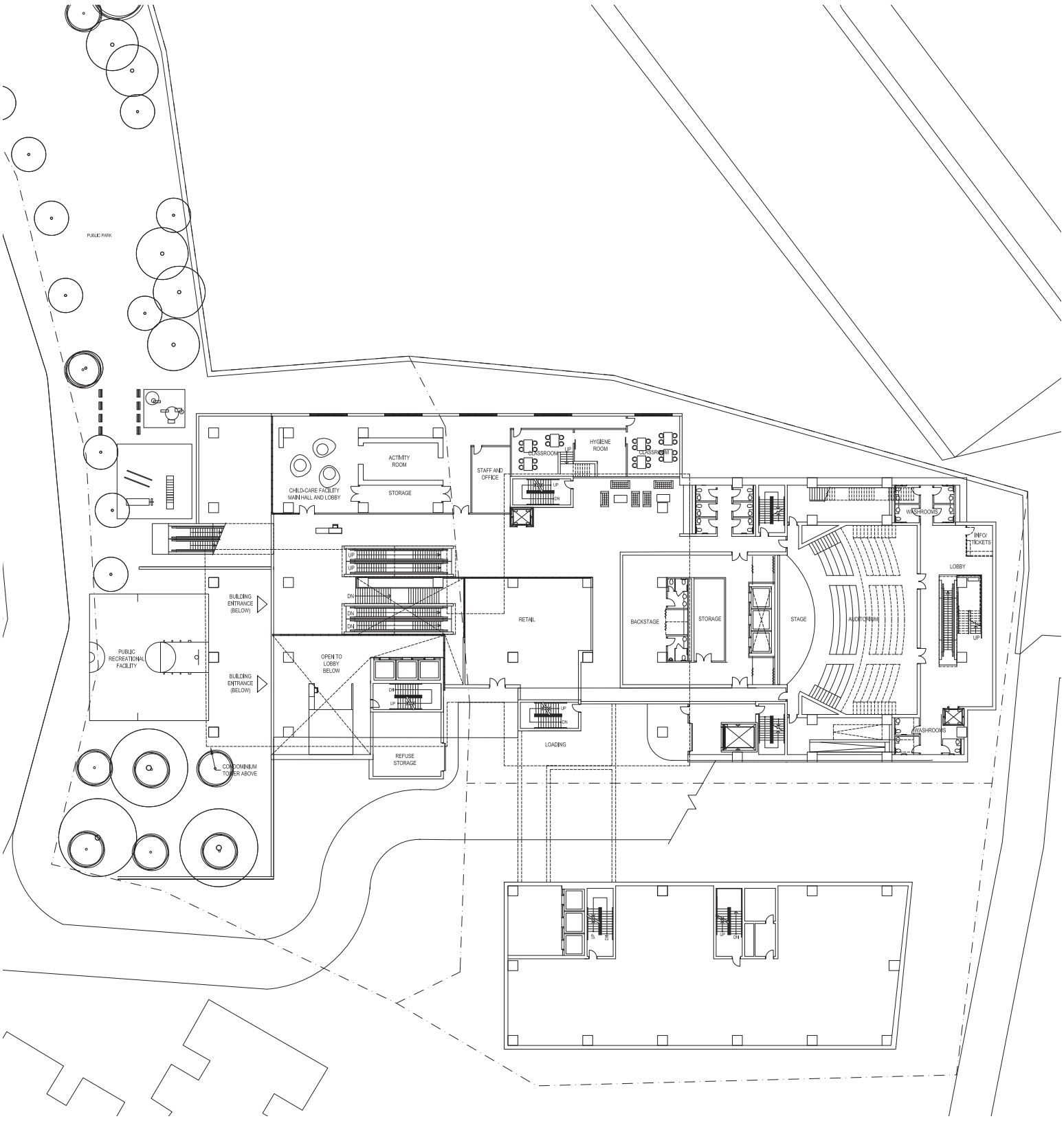
Underground pedestrian concourse connects the new development to the existing underground retail and pedestian network. New entrances at grade levels facing major traffic routes allows residences, students and staff to arrive by public transportations.

Block Type: Community Complex

Co-working Facility, Eatery and Lobby

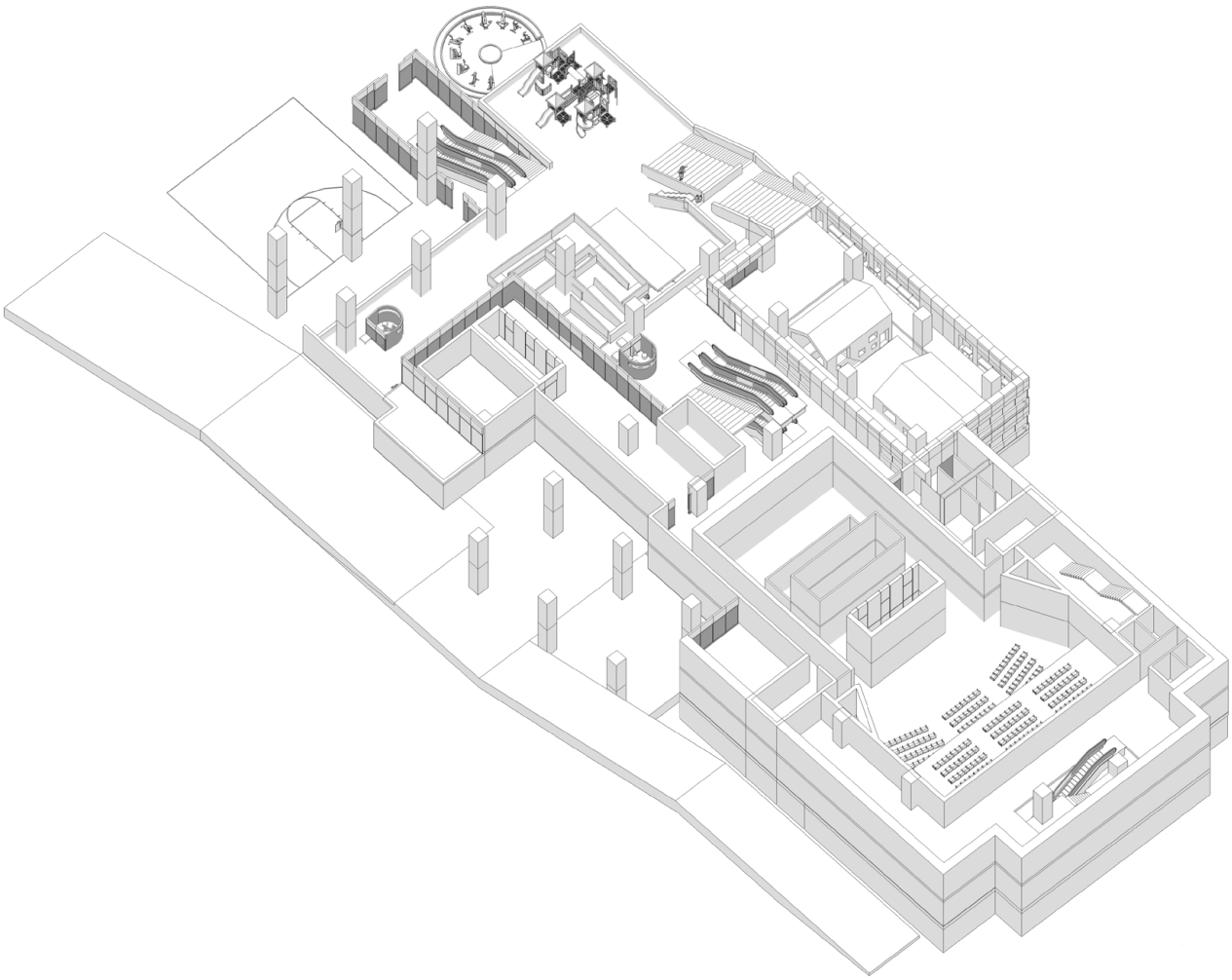
LOWER GROUND: Lower levels of the community center - featuring co-working facility and eatery.

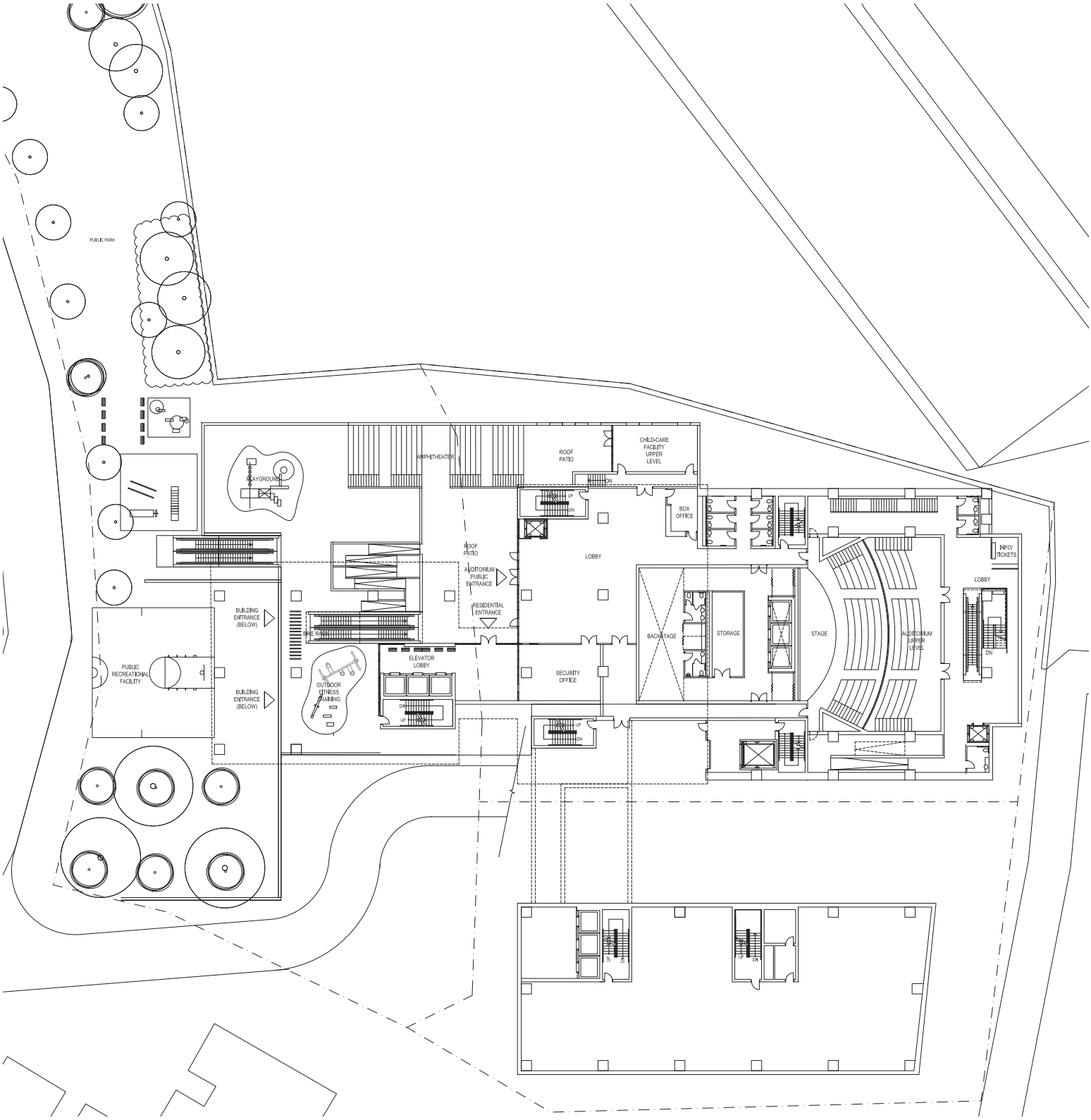
Rooftop Fitness Facility, Theater Lobby and Entrance



PODIUM 1: Outdoor playgrounds, outdoor fitness courts and equipment, child care facility and lower auditorium.

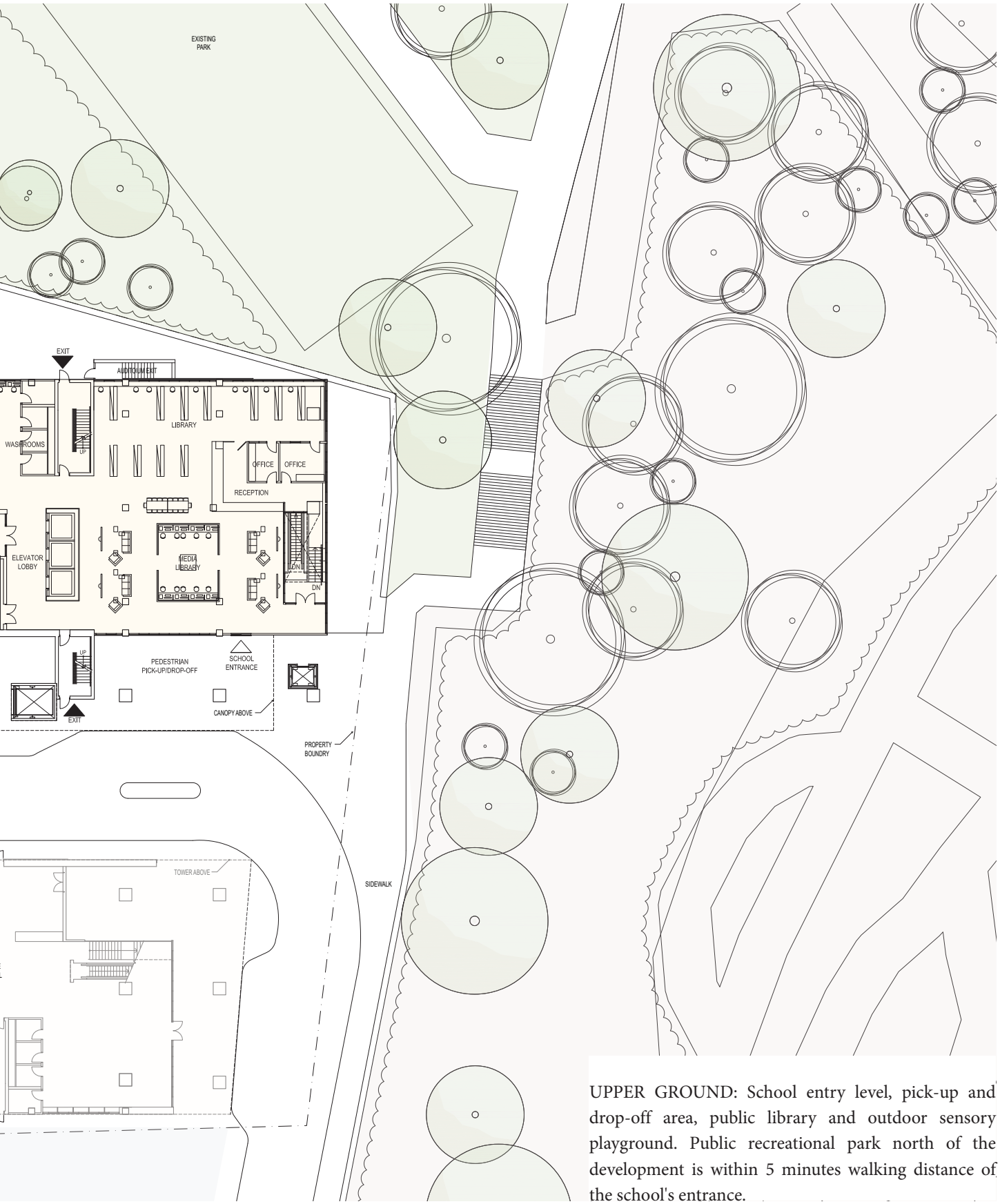
Upper Theater Lobby, Nursery and Loading





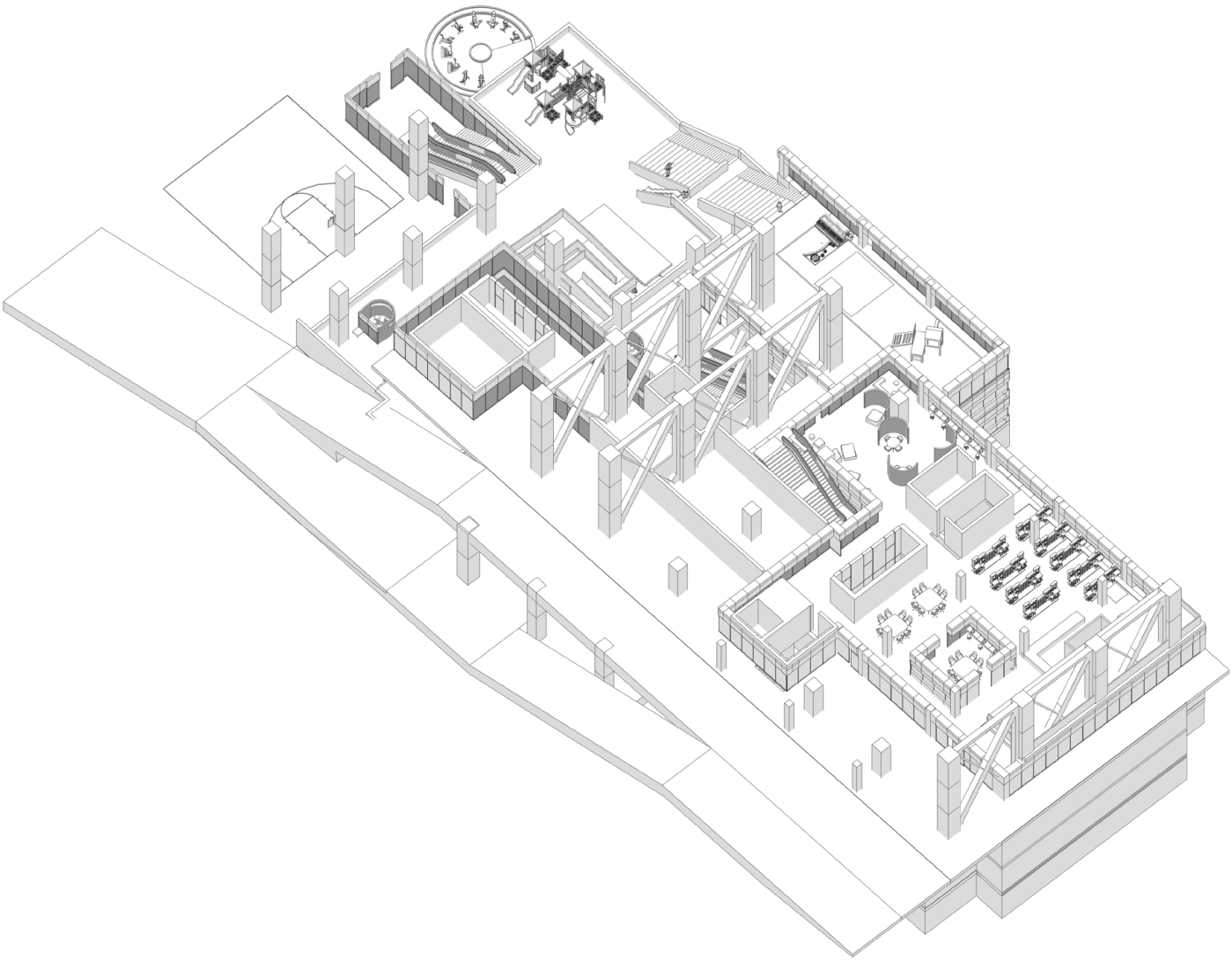
PODIUM 2: Residential lobby, upper levels of the auditorium and child care facility.


PUBLIC PARK
HILLSIDE
AMPHITHEATER
SCHOOL GARDEN
INFANT FEEDING
UP
DN
SCHOOL ENTRANCE
STUDENT LOUNGE
BUILDING ENTRANCE (BELOW)
RESIDENTIAL ENTRANCE
PUBLIC RECREATIONAL FACILITY
ELEVATOR LOBBY
STORAGE
LOADING
TOWER ABOVE
TOWER ABOVE
NO
FUTURE SCHOOL



UPPER GROUND: School entry level, pick-up and drop-off area, public library and outdoor sensory playground. Public recreational park north of the development is within 5 minutes walking distance of the school's entrance.

Amphitheater and playground at the podium roof top. A vibrant public space shared by all users at the mix-used development.



Podium level - roof top garden, play spaces, school entry lobbies and public library.

Outdoor garden and sensory learning playground

Block Type: Residential Tower

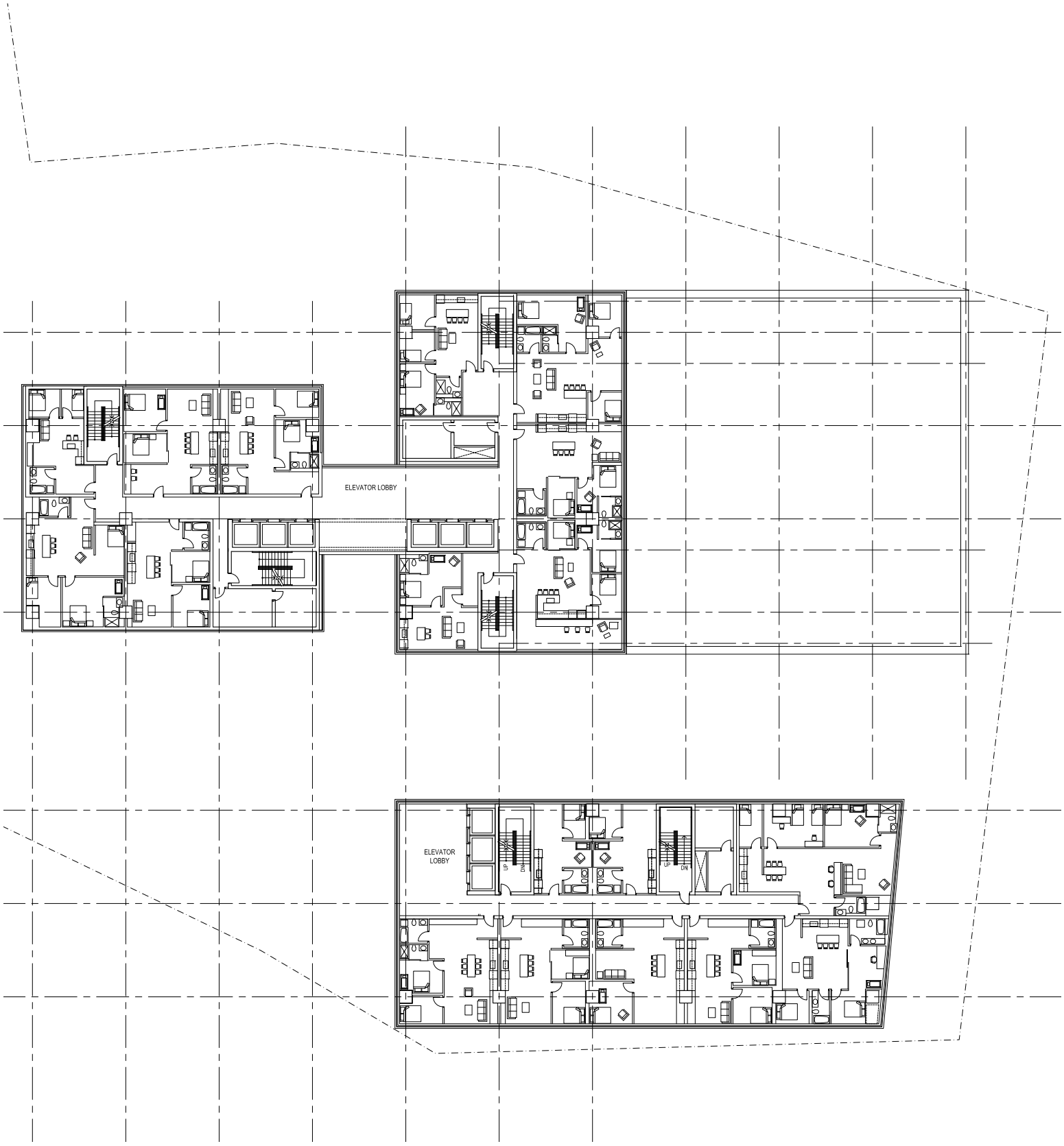
The Typical Floor Plan:

- Majority 2-3 bedrooms unit
- Enlarged lobby area as play and social zone on each floor
- Duo elevator core to break down the length of hallways ensuring a sense of safety
- Master bed rooms are big enough to fit an infant nursery

Gross Floor Area: 2595m^2

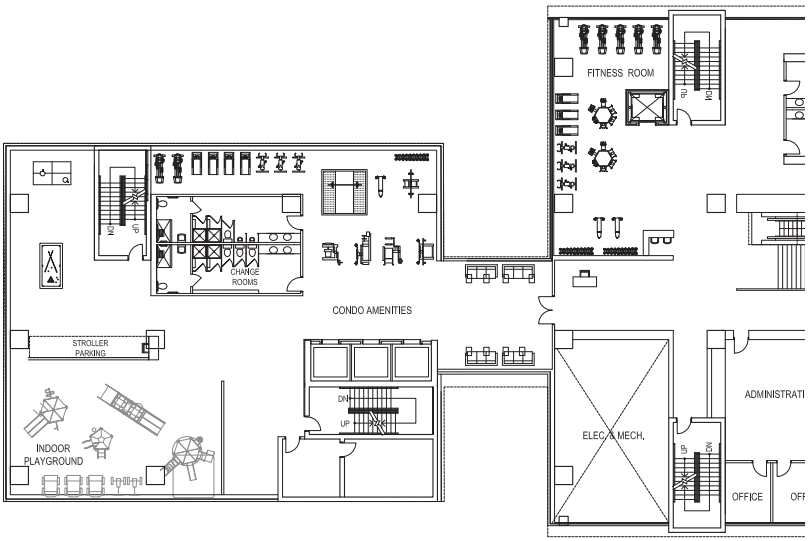
Number of Units per Floor:

- 5x3 Bedrooms
- 9x2 Bedrooms
- 4x1 Bedroom

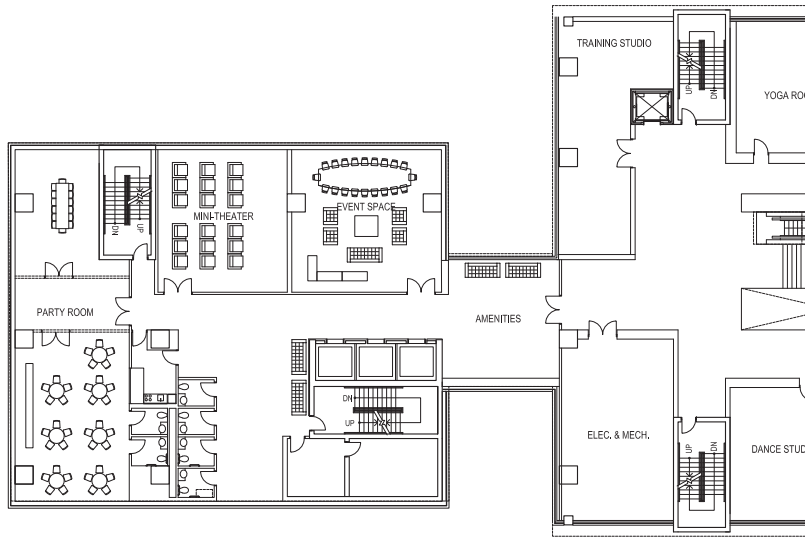


Typical residential floor plan

Recreational Amenities:



Upper Level Plan



Lover Level Plan

Residential amenity levels are connected to the schools gymnasium for after hours access.

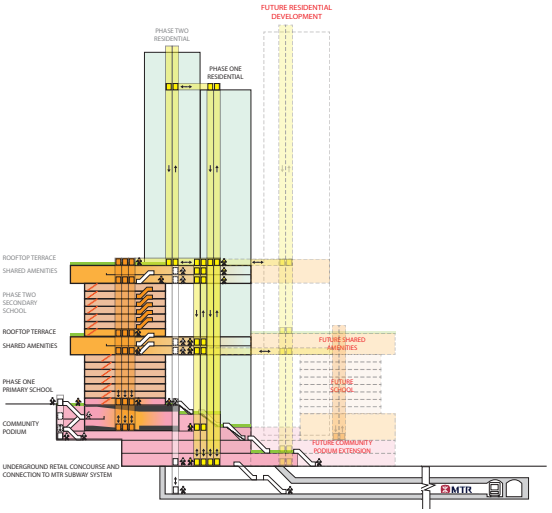
Conclusion:

Flexible K-12 Urban School Renewal as an Alternate Urban Family-Oriented Development

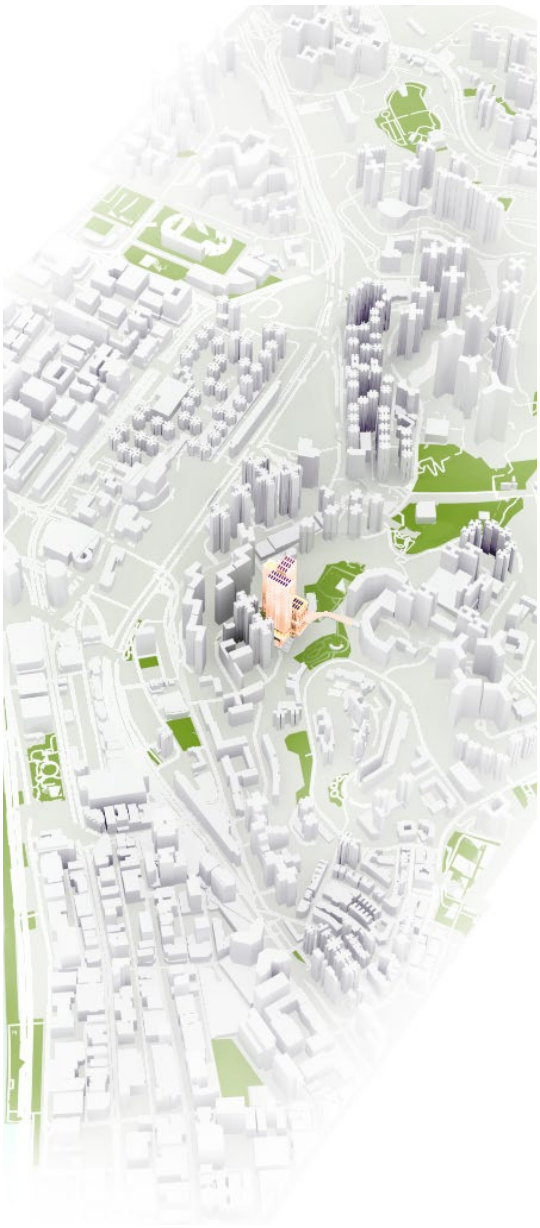
Urbanization is a trend in both developed cities and developing cities. City intensification and creating a walkable, compact city provides convenience, concentrated infrastructure and resources for better basic services like education, healthcare and housing. In many developed and higher income cities, like Hong Kong and Toronto, many young families are choosing the city center over the suburban context for raising the next generation. While people without children have primarily occupied many of these urban cores developed in the past two decades, demands for schools and student accommodations were lower. Urban families bring increasing demands for schools in the same areas that had fewer children 10-20 years ago. Research shows that overcrowded schools are affecting children, their families, the staff at schools and their resources at schools. While cities are continuously going through redevelopment and intensification process to increase and meet housing demands, the need for more school placements is becoming more crucial to urban liveability.

Urban Connectivity - Transit Oriented Development, Families and Schools

Urban families are making an impact in the urbanization process in cities, and cities are responding quickly. Cases in Toronto, Melbourne, and Hong Kong S.A.R were studied more closely in Part 1 of this thesis to establish a spectacle to focus on the growth of the young families in the cores. Then through case studies, analyzed the responding urban master planning in each city targeting the phenomenon. Melbourne has taken a proactive approach to increase accommodations for families in the city as seen in the Fishman's Bend (National employment and innovation cluster) urban renewal plan[1]. The plan has identified schools as an urban apparatus for developing a vibrant community. In Toronto, a "Complete-Community" urban approach has driven some of the major improvements in the city's transit system, streetscapes and liveability. Hong Kong has been a compact vertical city since the mid-19th century. Living in high-rise development is the most common and affordable option for the majority of the citizen. The Mass Transit Railway (MTR) system brings convenience and most importantly, economic value to the urban environment in Hong Kong. According to Robert Cervero, Transit Oriented Development (TOD) – an urban approached connecting real estate development to transit hub as a strategy to achieve a functional "Complete Community" – has brought a positive influence to densifying residential developments and creating a well-knit, walkable and economically sustainable downtown community[2].



1 Victoria State Government. "Fishermans Bend Framework: The next chapter in Melbourne's growth story – draft for consultation". Melbourne: Victoria State Government, 2017. Accessed July 15, 2018.
2 Cervero, Robert. The Transit Metropolis : A Global Inquiry. Washington, D.C.: Island Press, 1998.

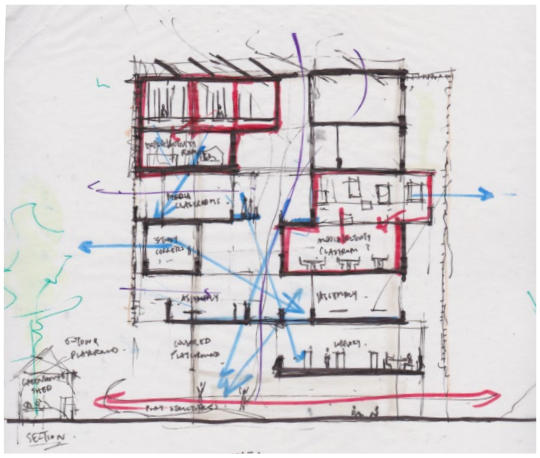


Integrating Schools into the City Fabric

Housing in the city is becoming a more popular choice of living. Families now have the option to live an urban lifestyle where children will be growing up in the city. Since the number of students increases, school accommodations should increase to avoid and prevent overcrowded schools. Schools require large outdoor and indoor recreational areas to facilitate proper educational progressions for students. Land value is higher in the urban cores than the periphery areas. Rationalising large pieces of urban land for low-density schools becomes a difficult decision for the growth of many cities. The thesis challenges the low-rise school typology and proposes that schools could function in a compact building. Similar to the approach of stacking spaces in housing and commercial buildings in the dense cities. The vertical school typology in this proposal takes a similar architectural approach by stacking educational spaces.

Taking A closer look at Urban School Typologies

Education has changed so rigorously in this past two decades; older school buildings no longer have the right environment for our technologically focused, accelerating, multi-disciplinary project-based learning educational curriculums. The newer 21st-century school typology has brilliantly addressed the architectural quality required for the contemporary educational trends, yet, many older schools are still struggling to provide an equivalent learning environment for families who pay the same amount of tax to the government for the same educational system. These schools are potentials to be redeveloped into greater new schools. The vertical school could replace the original outdated facility with architecturally appropriate spaces for 21st-century learning and increases density. The introduction of new interactive spaces within the school and utilizing double height large spaces as the featuring architectural approach will facilitate collaborative learning. The central core, where formal and informal learning occurs, incorporates smaller-scaled elements to draw people away from the periphery of the larger rooms. Furthermore, adding flexible floor spaces and improving vertical circulation strategies will help to maintain day-to-day traffic in a higher density school.

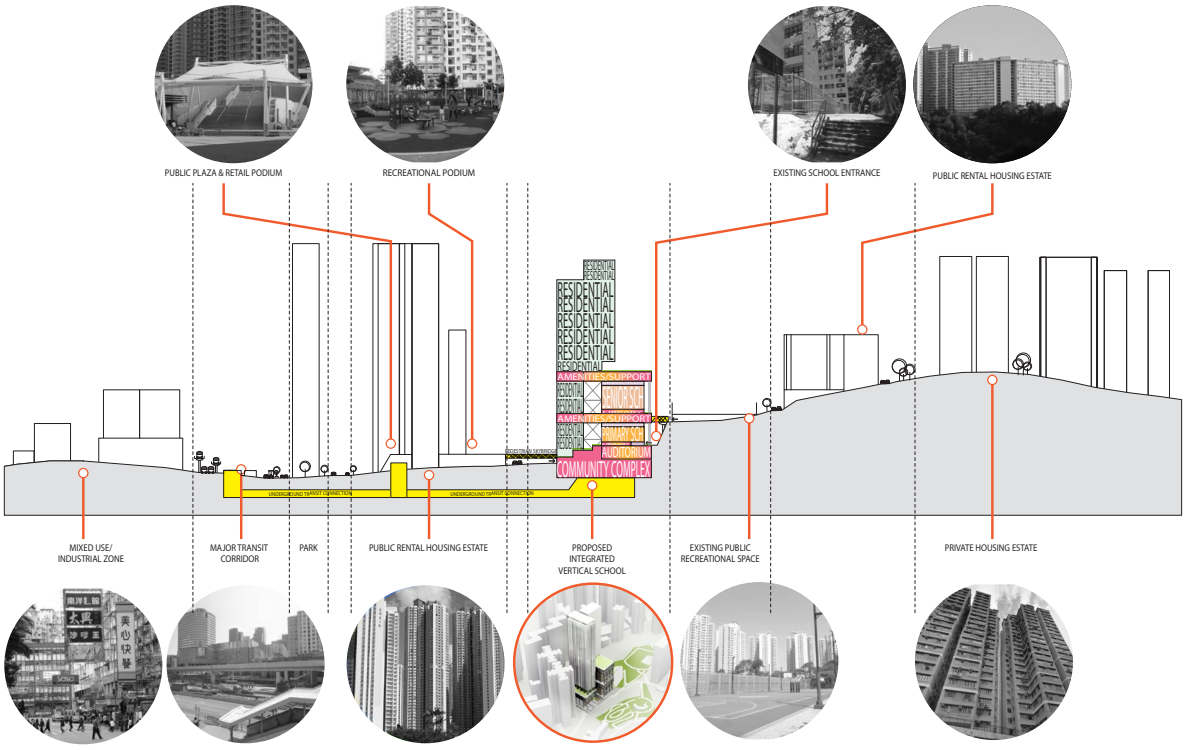


Design Response

The integrated-vertical school typology aims to address the need for schools in the urban areas by proposing to integrate the K-12 school into new residential developments to ease some of the stress that urban schools are facing.

Compact Community

At a micro level, families are experiencing stress in their day-to-day lives by having to arrange and achieve the busy daily schedules while living a meaningful life outside of their workplaces and schools. Elderly, in the cities, need places to go for a healthy social life and, children in our cities need places to play. Putting the high-rise home, the community facility and multiple schools together form an innovative mixed-use vertical village sets "the family unit" as the prioritized audience. It is an attempt to ease some of the stress from living in the condensed cities. First, by reducing travelling times between the home and the school, and by providing safe and direct access to the amenities that children and elderly may need during that day within the same complex of their home. Secondly, the complex has direct access to the local transit systems. This makes travelling to other parts of the city for leisure activities or other events convenient. Lastly, creating places for children is proven to be a good social practice as it makes these places more inviting and welcoming for all ages - designing for children makes spaces more vibrant, approachable and, most importantly, it gives further emphasis on personal safety.



Flexible and Adaptable School Spaces

The school was the primary focus of the design, and one of the key design goals was to improve the architectural adaptability of school buildings. Research on the evolution of schools shows that school building is a typology that experience changes over time due to factors ranging from student numbers, pedagogical practices, technology, local demographics, users' preferences and sustainability measures. Therefore, school architecture must be adaptable and flexible. The school block in this design is based on a universal structural system which consists of a basic slab-and-column 9mx9m structural grid that is commonly used for many other types of commercial, residential structures and, parking structures. The floor slabs and other building components are designed as modular pieces which speed up the initial construction process and makes future renovation and addition more achievable.

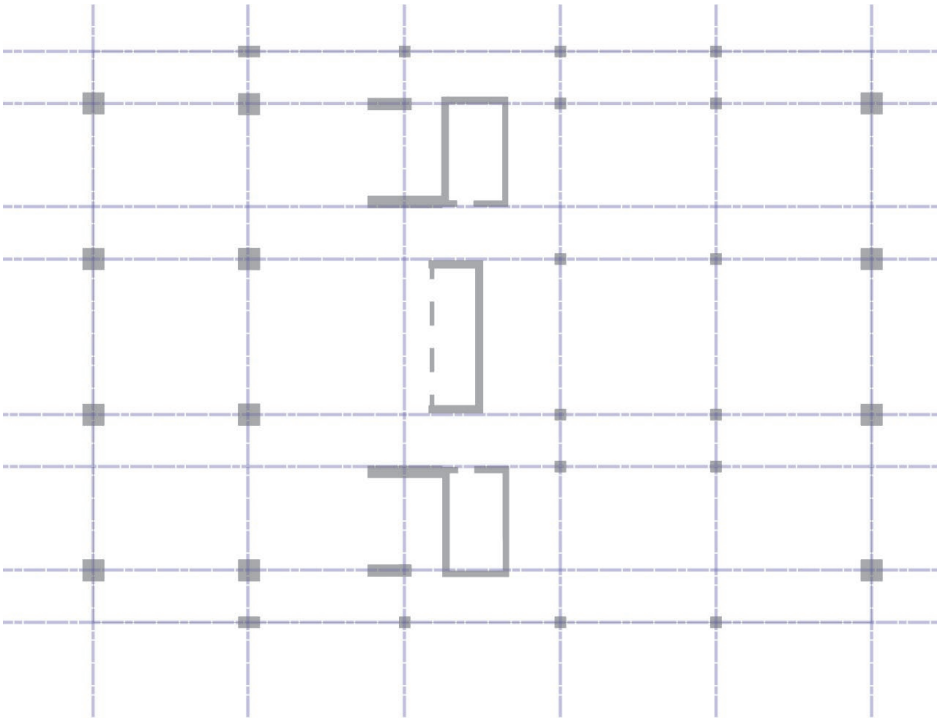


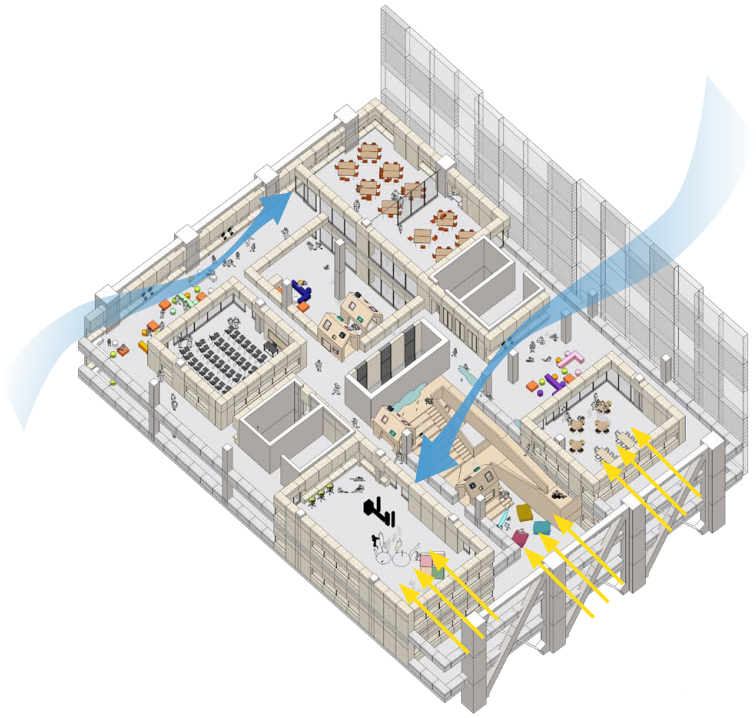
Figure 164 Structural digram

Primary school hub

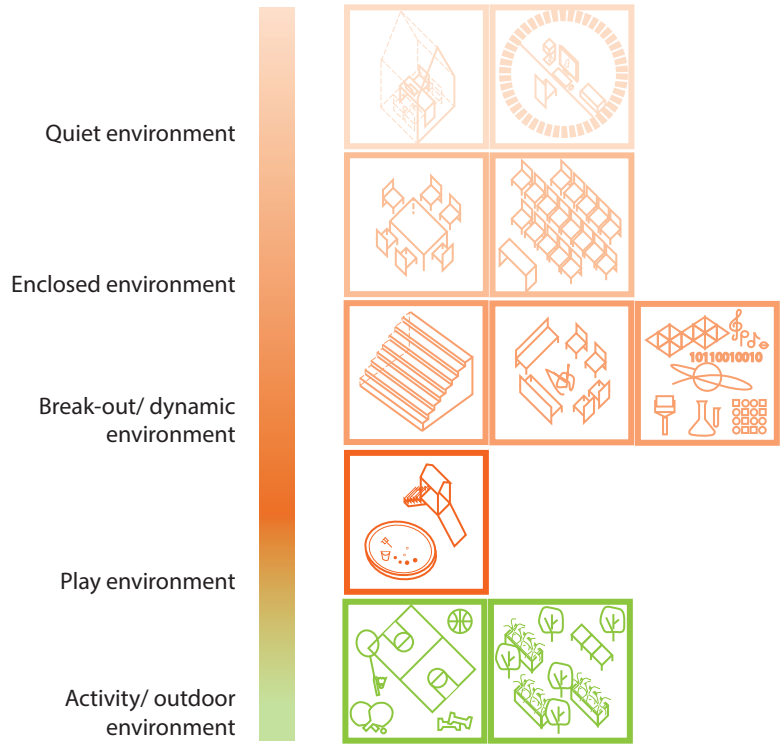
Secondary school hub

Given that the student enrollment situations and the program requirements in schools are constantly fluctuating factors. The double storey module further improves the spatial diversity by adding flexibility to the third dimension of each space. The opportunity for double height inter-connectivity improves overall transparency and opens up possibilities for natural ventilation and passive lighting. Multiple means of vertical transportation are provided in the schools to ensure rush-hour traffic are accommodated. The schools are designed to be a sustainable response to the specific local climate, in this case, weather protected outdoor facility with minimal mechanically conditioned enclosures. Materiality and program separation - determined by a scale of acoustical environment overlay - are strategies used to achieves acoustical separations in such an open environment.

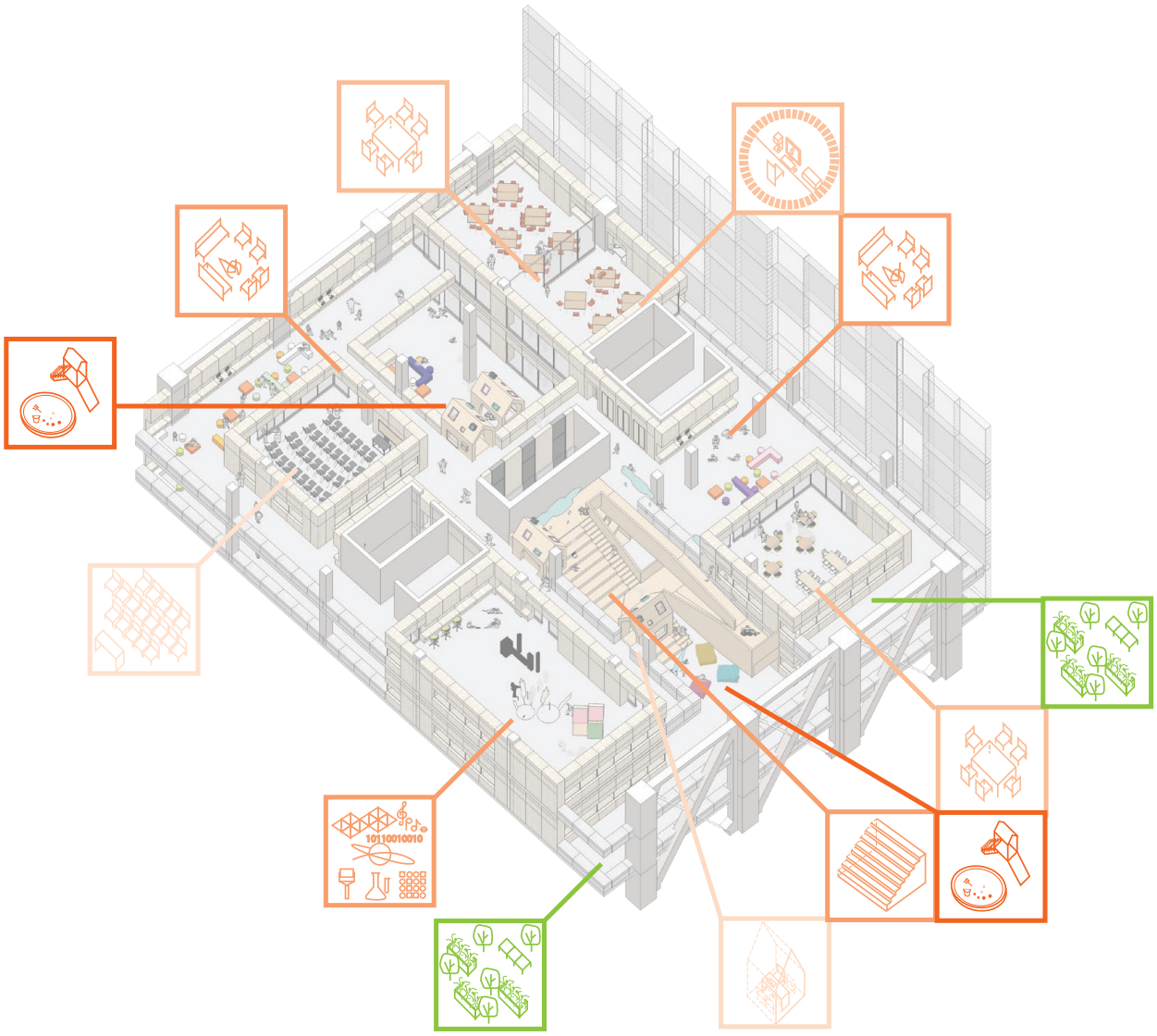
The school is tightly interlocked with the community facility on site to promote community integration and land optimization. The development encourages the sharing of community resources and the optimization of high-value urban lands. Higher cost facilities such as the auditorium, the full-size gymnasium and the library are built-into the integrated program so that concentrated financial investment is spent into the construction of higher-quality facilities that can benefit a diverse audience.



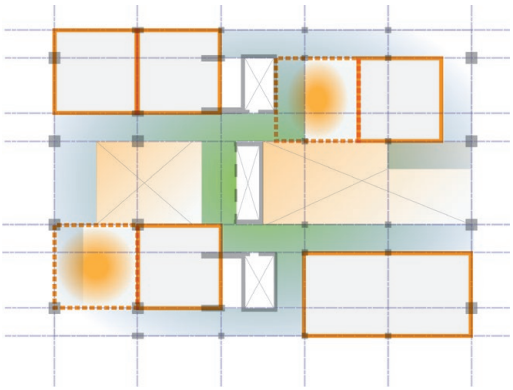
Lighting and natural ventilation diagram

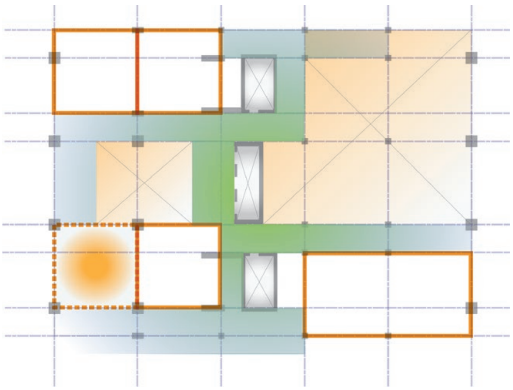


Scale and types of acoustical environments.



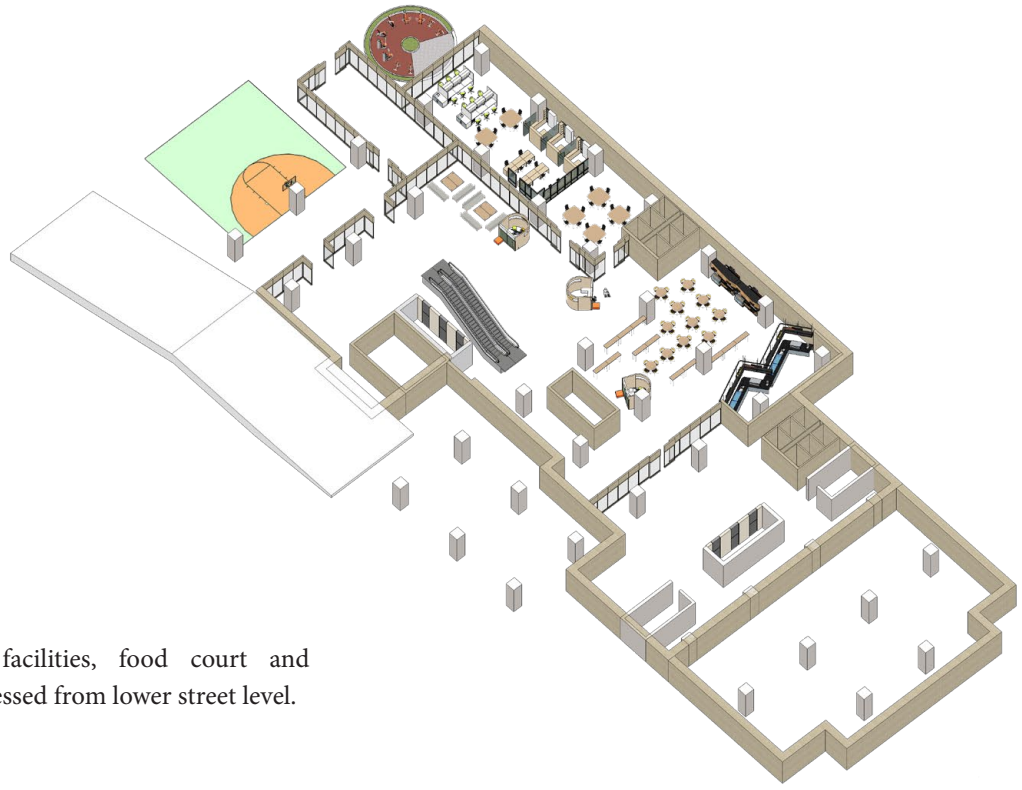
Acoustical requirements overlay.





Adjusting to the Demographics

The development aims to be a family-friendly vertical community that works in the contemporary cities. Urban family's priorities in work-life balance and education continually reshape the urban environments. The flexible and adaptable schools at the lower levels can bridge an important development gap between housing and schooling that is affecting families with children and youth in these urban areas. Furthermore, the Integrated Vertical School fulfils the multifaceted needs of our urban residential communities in today's society. It has direct and walkable access to nearby public transits. Shared amenities and public facilities where utilization can be managed and optimized. The primary school and secondary school are located on top of each other. The thesis presumes that the architectural flexibility provides the capability to transform the double storey teaching blocks to be used by both student demographics with minimal renovations. Minimal architectural transformation allows the school building to adapt to the latest demographics predictions. Additional detailed investigation in the construction methodology is needed to demonstrate the actual viability of this assumption. This design aims to provide an exemplary typological approach of a mixed-use high-rise building. Some specific approaches, for example, climate-related sustainable strategies and site-specific approaches may need to be reconsidered and modified to suit other similar redevelopment sites. The methods that will be suitable as a reference for other developments are the massing and programming strategies, circulation approaches and internal spatial configurations of the school.



Community co-working facilities, food court and recreational facilities at accessed from lower street level.

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Appendix

中華人民共和國香港特別行政區政府總部教育局
Education Bureau
Government Secretariat, The Government of the Hong Kong Special Administrative Region
The People's Republic of China

本局檔號 Our Ref.: EDB(SB)AL/3/15III
來函檔號 Your Ref.: CB4/PL/ED
電話 Telephone: 3509 7504
傳真 Fax Line: 2573 3467

22 February 2016

(By Fax : 3151 7052)

Clerk to Panel
Panel on Education
Legislative Council
Legislative Council Complex
1 Legislative Council Road
Central, Hong Kong

(Attn: Mr Kwong Kam-fai)

Dear Mr Kwong,

Panel on Education

Meeting on 22 March 2016 and
follow-up to meeting on 14 December 2015

I refer to your letter dated 9 March 2016 on the captioned subject, conveying the Panel Chairman's request for the provision of the names and addresses of the 28 public sector schools currently operating in "matchbox-style" school premises as mentioned in our reply of 15 February 2016. We have consulted the 28 schools concerned on whether they would agree to our releasing their school information to the Panel.

Of the 28 schools concerned, 26 schools have sent in their replies. 23 of them have no objection to the release of their school information to the Panel while three schools do not agree so. The information related to the 23 schools which have given their consent is set out in the Annex for Members' information.

Yours sincerely,

(Mrs Elina Chan)
for Secretary for Education

Annex

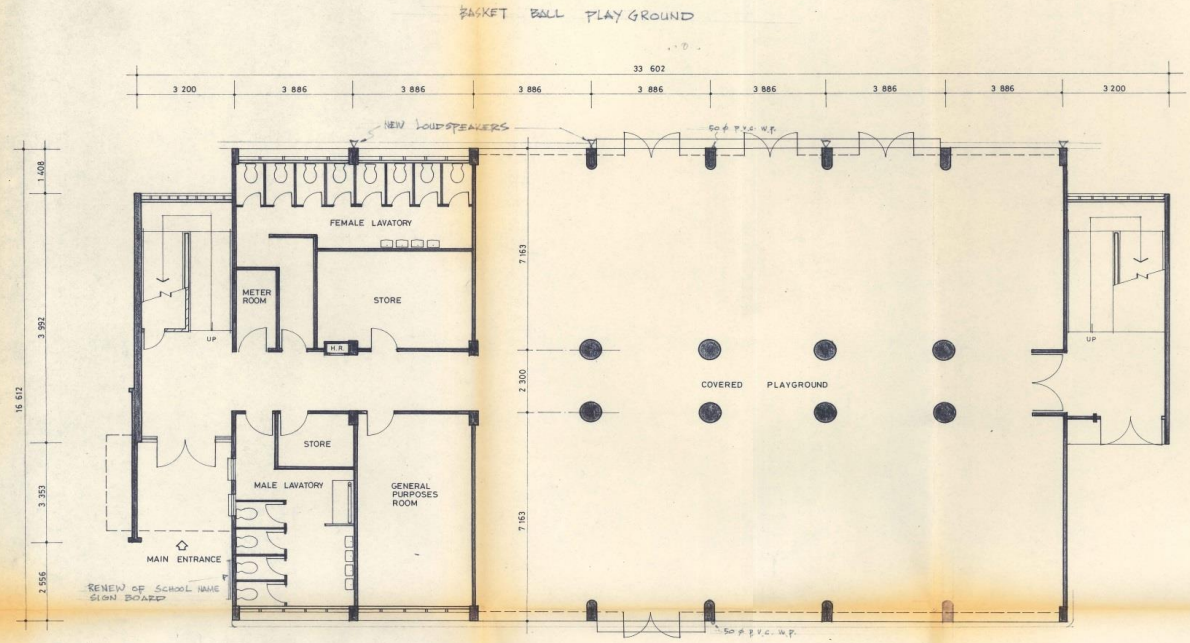
Information of the 23 cuboidal shaped school premises

	School	District	No. of years since completion of school premises		SIP conducted	Has indicated a need for R&R	
			30-40 years	41-50 years		Yes	No
1.	The Evangelical Lutheran Church of Hong Kong Faith Love Lutheran School	Estate School No. 2, Yue Wan Estate, Chai Wan.	√		√	√	
2.	Pak Tin Catholic Primary School*	Block 3, Pak Tin Estate, Shum Shui Po.		√	√	√	
3.	Po Yan Oblate Primary School	15 Lok Sin Road, Kowloon		√	√	√	
4.	Po Leung Kuk Mrs Chan Nam Chong Memorial Primary School	G/F, Choi Wan Estate, Clear Water Bay Road, Kowloon.	√		√	√	
5.	Carmel Leung Sing Tak School	Estate School No. 2, Shun On Estate, Kwun Tong.	√		√	√	
6.	Ping Shek Estate Catholic Primary School	Estate School No. 1, Shun On Estate, Kwun Tong.		√	√	√	
7.	Hong Kong Taoist Association Wun Tsuen School	Upper Ngau Tau Kok Estate, On Shin Road, Kwun Tong.		√	√	√	
8.	Man Kiu Association Primary School	Estate School No. 3, Upper Ngau Tau Kok Estate, Kwun Tong.		√	√		√
9.	Father Cucchiara Memorial School	Estate School No. 2, Cheung Ching Estate, Tsing Yi.	√		√	√	
10.	Asbury Methodist Primary School	Estate School No. 2, Lai King Estate, Kwai Chung		√	√	√	
11.	CNEC Ta Tung School	Estate School No. 1, Kwai Hing Estate, Kwai Chung.		√	√	√	
12.	The Evangelical Lutheran Church of Hong Kong Kwai Shing Lutheran Primary School	Estate School No. 6, Kwai Shing Estate, Kwai Chung.		√	√	√	

	School	District	No. of years since completion of school premises		SIP conducted	Has indicated a need for R&R	
			30-40 years	41-50 years		Yes	No
13.	S.K.H. Chu Yan Primary School	Estate School No. 2, Kwai Shing Estate, Kwai Chung.		√	√	√	
14.	Sir Robert Black College of Education Past Students' Association Lee Yat Ngok Memorial School	221 Kwai Shing Circuit, Kwai Chung.	√		√		√
15.	Lei Muk Shue Catholic Primary School	Estate School No. 2, Lei Muk Shue Estate, Tsuen Wan.		√	√	√	
16.	Tsuen Wan Public Ho Chuen Yiu Memorial School	Estate Primary School No. 1, Shek Wai Kok Estate, Tsuen Wan.	√		√	√	
17.	S.K.H. Holy Spirit Primary School	Lek Yuen Estate, Shatin.	√		√	√	
18.	The Little Flower's Catholic Primary School	Wo Che Estate, Shatin.	√		√	√	
19.	The Evangelical Lutheran Church of Hong Kong Wo Che Lutheran School	Wo Che Estate, Shatin.	√		√	√	
20.	Shatin Tsung Tsin School	Lek Yuen Estate, Shatin.		√	√	√	
21.	Toi Shan Association Primary School	14 Shek Pai Tau Road, Tuen Mun.	√		√	√	
22.	Po Leung Kuk Vicwood K.T. Chong No. 2 Primary School	Tai Hing Estate, Tuen Mun.	√		√	√	
23.	Islamic Primary School	2 Oi Tak Lane, Yau Oi Estate, Tuen Mun.	√		√		√

"*" The School will be reprovisioned

Matchbox Schools Floor Plans



GROUND FLOOR PLAN

B.L.D. REF. NO.

F.P.B. NO.

FIGURED DIMENSIONS ARE TO BE TAKEN IN PREFERENCE TO SCALED ONES IN ALL CASES.

BEFORE COMMENCING ANY WORK OR ORDERING ANY MATERIALS THE CONTRACTOR MUST VERIFY ALL MEASUREMENTS OF THE BUILDING. IF ANY DISCREPANCIES ARE FOUND THEY MUST BE BROUGHT TO THE NOTICE OF THE ARCHITECT IMMEDIATELY.

PROJECT

PROPOSED ALTERATION & ADDITION TO FATHER CUCCHIARA MEMORIAL SHOOL CHEUNG CHING EST. TSING YI ISLAND N.T.

PLAN

PLAN

SCALE

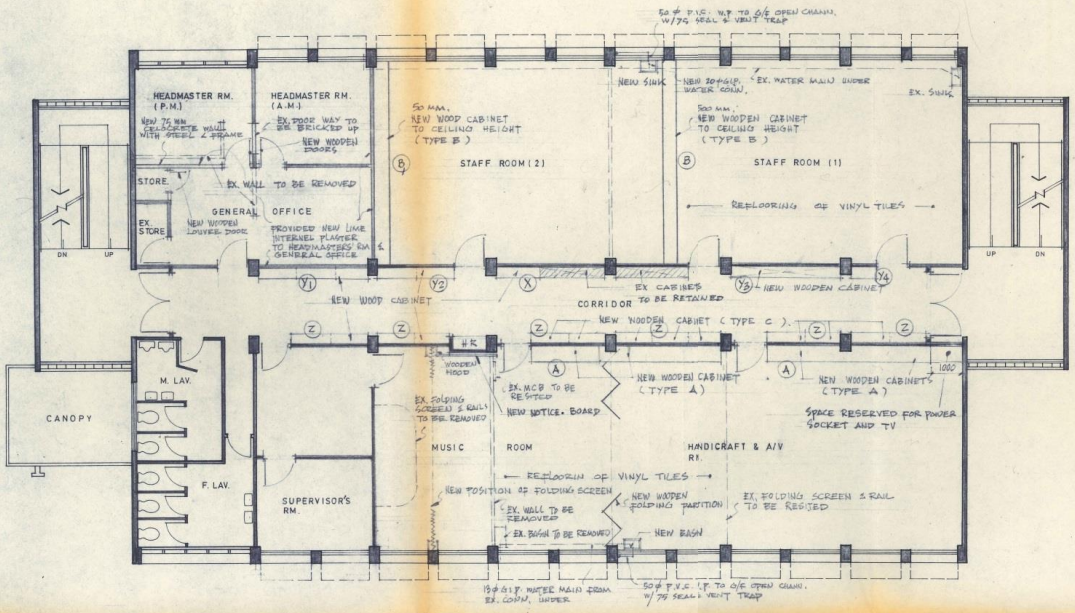
1 : 100

T.K. TSUI & ASSOCIATES
CHARTERED ENGINEERS & ARCHITECTS
崔德剛 建築師 工程師
T.K. TSUI DIP. B. SC. (L'POOL), M. ASCE., F. I. STRUCT., R. P. HKIE., AUTHORISED PERSON & R.S.E.

DRAWN CHECKED

FIRST APPROVAL:

DRAWING NO. 1/4



FIRST FLOOR PLAN

NOTES OF CONVERSION WORK :-

1. ALL LIGHTS AND FANS REWIRING
2. FLUORESCENT LIGHTS AND CEILING FAN TO BE RELOCATED IN FOUND NECESSARY.
3. ADDITION INSTALLATION OF LOUSPEAKERS FACING THE BASKET BALL PLAYGROUND AS INDICATED ON PLAN
4. INSTALLATION OF INTERCOM ON ALL FLOORS.
5. INSTALLATION OF CENTRAL VIDEO OUTPUT TROUGH WITH WIRING TO CLASS ROOMS.
6. REFLOORING OF VINYL TILES ON FIRST FLOOR
7. ADDITIONAL WOODEN CABINET AS INDICATED ON PLAN.
8. ADDITIONAL 1 NO. OF SPORT LIGHT AT POSITION OF 3/F LEV.
9. RENEW OF SIGN BOARD AT GRD FLOOR ENTRANCE
10. RENEW OF SCHOOL NAME PLASTER SIGN OUTSIDE WALL ON TOP FLOOR
11. ALL EX. CABINETS AND EX. SHELVES AT CORRIDOR ON 1/F TO BE REMOVED BY CONTRACTOR EXCEPTED THE RETAINED CABINET

B.L.D. REF. NO.

F.P.B. NO.

FIGURED DIMENSIONS ARE TO BE TAKEN IN PREFERENCE TO SCALED ONES IN ALL CASES.

BEFORE COMMENCING ANY WORK OR ORDERING ANY MATERIALS THE CONTRACTOR MUST VERIFY ALL MEASUREMENTS OF THE BUILDING. IF ANY DISCREPANCIES ARE FOUND THEY MUST BE BROUGHT TO THE NOTICE OF THE ARCHITECT IMMEDIATELY.

PROJECT

PROPOSED ALTERATION & ADDITION TO FATHER CUCCHIARA MEMORIAL SCHOOL CHEUNG CHING EST. TSING YI ISLAND N.T.

PLAN

PLAN

SCALE

1 : 100

T.K. TSUI & ASSOCIATES
CHARTERED ENGINEERS & ARCHITECTS
崔德剛 建築師 工程師
T.K. TSUI DIP. B. SC. U'POOLI, M. ASCE., F. I. STRUCT. E., F. HKIE., AUTHORISED PERSON & R.S.E.

DRAWN CHECKED

FIRST APPROVAL:

DRAWING NO. 2/4

A			
B			
C			
D			
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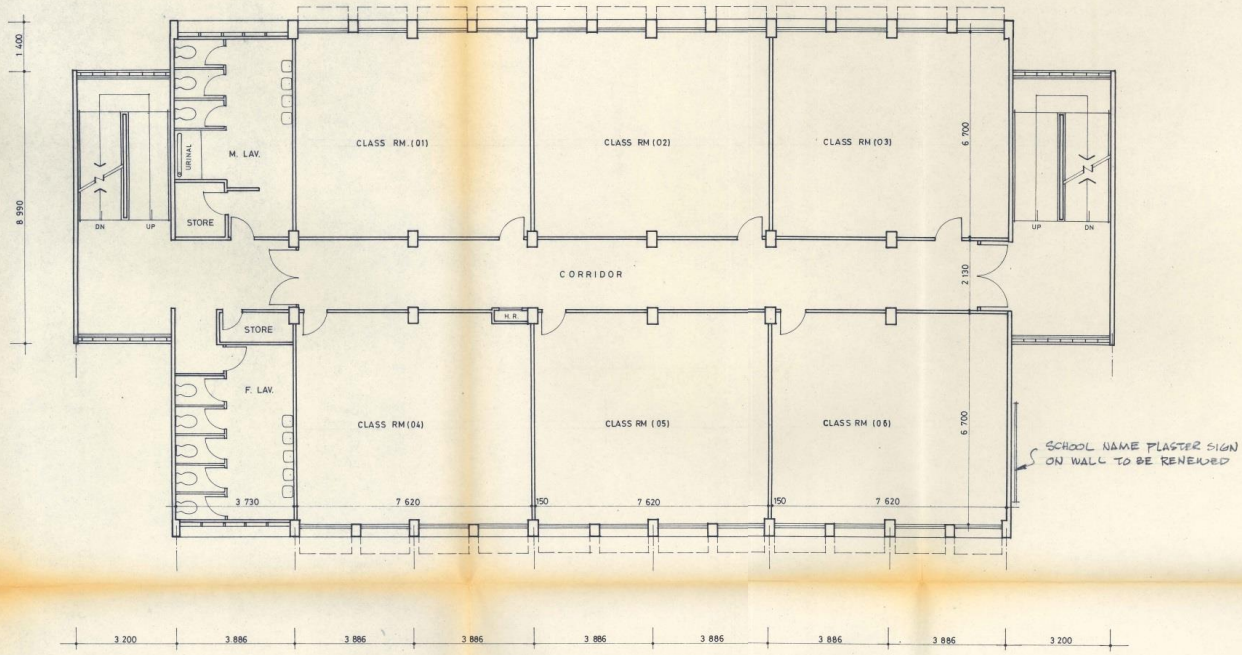


2ND. TO 5TH. FLOOR PLAN

B.L.D. REF. NO.

F.P.B. NO.

FIGURED DIMENSIONS ARE TO BE TAKEN IN PREFERENCE TO SCALED ONES IN ALL CASES.

BEFORE COMMENCING ANY WORK OR ORDERING ANY MATERIALS THE CONTRACTOR MUST VERIFY ALL MEASUREMENTS OF THE BUILDING. IF ANY DISCREPANCIES ARE FOUND THEY MUST BE BROUGHT TO THE NOTICE OF THE ARCHITECT IMMEDIATELY.

PROJECT

PROPOSED ALTERATION & ADDITION TO FATHER CUCCHIARA MEMORIAL SCHOOL CHEUNG CHING EST. TSING YI ISLAND N.T.

PLAN

PLAN

SCALE

1 : 100

T.K. TSUI & ASSOCIATES
CHARTERED ENGINEERS & ARCHITECTS
崔德剛 建築師 工程師

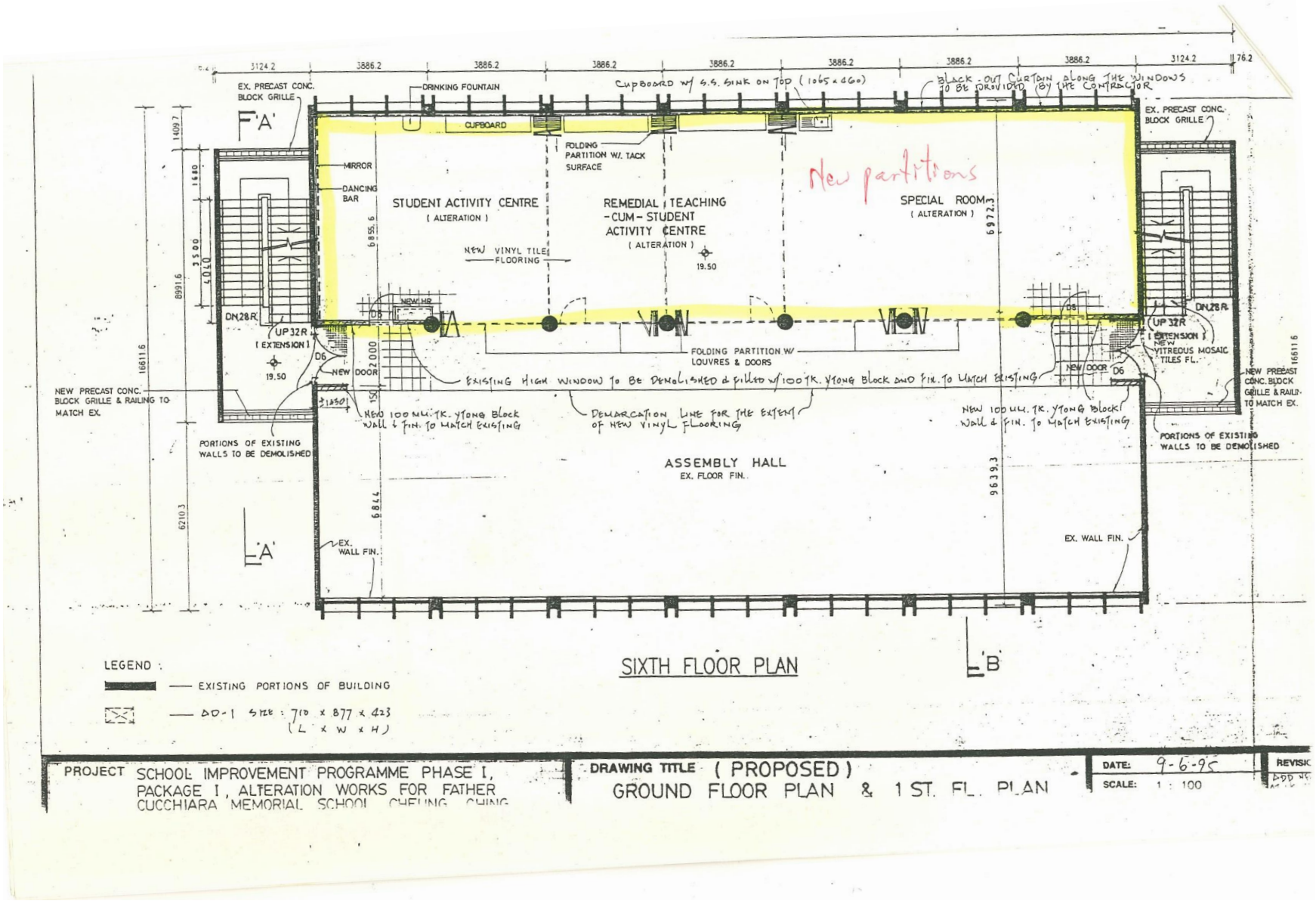
T.K. TSUI DIP. B. SC. (L'POOL), M. ASCE., F. I. STRUCT. E., F. HKIE., AUTHORISED PERSON & R.S.E.

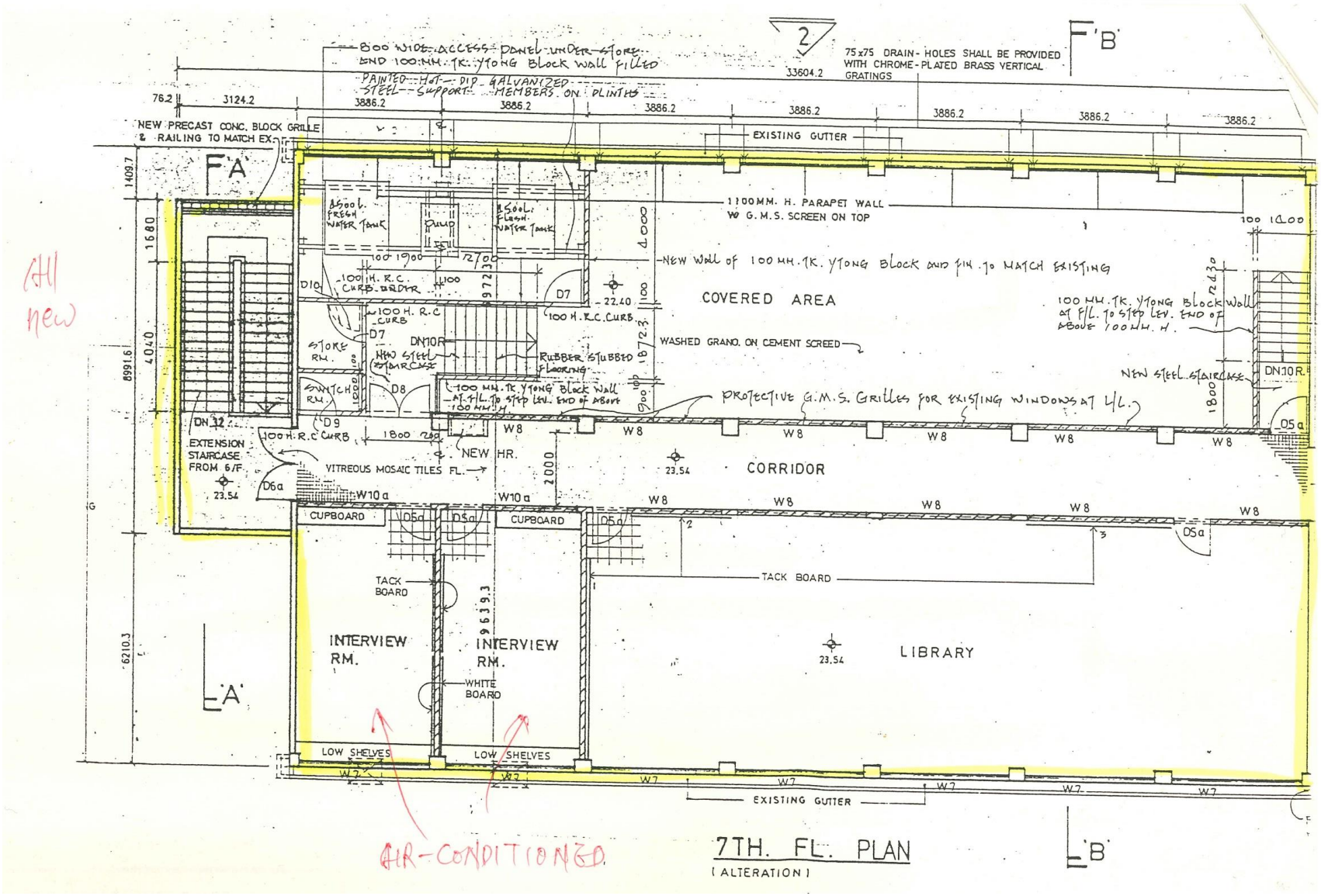
DRAWN CHECKED

	FIRST APPROVAL:
A	
B	
C	
D	
E	

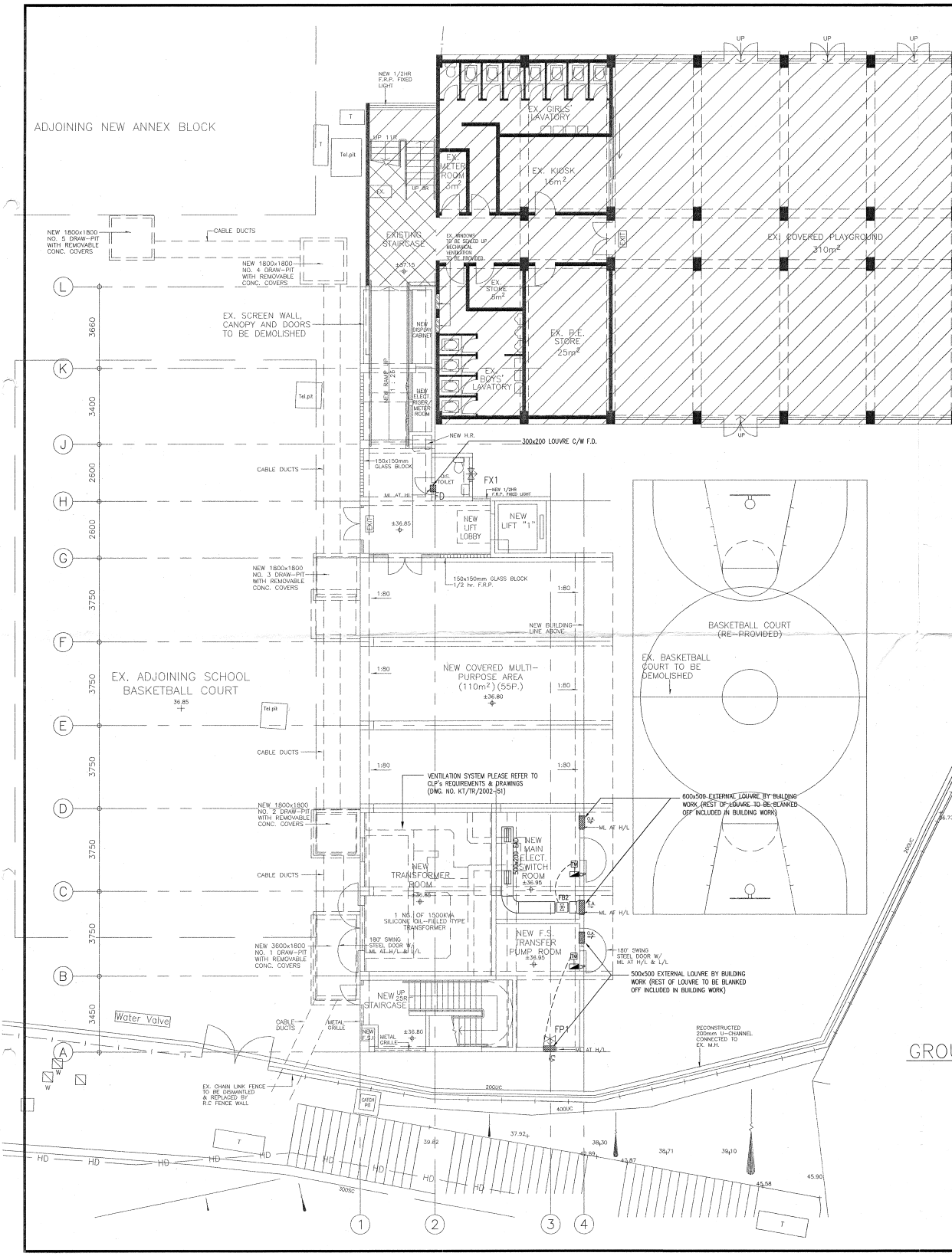
DRAWING NO.

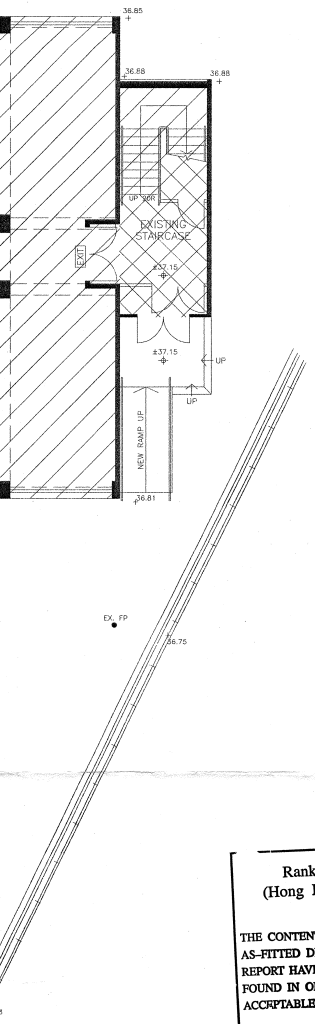
3/4


EX. PRECAST CONC. BLOCK GRILLE
DRINKING FOUNTAIN
CUPBOARD W/ S.S. SINK ON TOP (1065 x 660)
BLACK-OUT CURTAIN ALONG THE WINDOWS TO BE PROVIDED BY THE CONTRACTOR
CUPBOARD
FOLDING PARTITION W/ TACK SURFACE
MIRROR
DANCING BAR
STUDENT ACTIVITY CENTRE
(ALTERATION)
REMEDIAL TEACHING -CUM- STUDENT ACTIVITY CENTRE
(ALTERATION)
New partitions
SPECIAL ROOM
(ALTERATION)
NEW VINYL TILE FLOORING
19.50
NEW HR
D6
DN28R
UP32R
(EXTENSION)
NEW DOOR
FOLDING PARTITION W/ LOUVRES & DOORS
EXISTING HIGH WINDOW TO BE DEMOLISHED & FILLED W/ 100TK. YTONG BLOCK AND FIN. TO MATCH EXISTING
NEW PRECAST CONC. BLOCK GRILLE & RAILING TO MATCH EX.
NEW 100 NLH. TK. YTONG BLOCK WALL & FIN. TO MATCH EXISTING
DEMARCATION LINE FOR THE EXTENT OF NEW VINYL FLOORING
PORTIONS OF EXISTING WALLS TO BE DEMOLISHED
ASSEMBLY HALL
EX. FLOOR FIN.
EX. WALL FIN.
NEW VITREOUS MOSAIC TILES FL.
'A'
'B'
LEGEND :
EXISTING PORTIONS OF BUILDING
DD-1 SIZE : 710 x 877 x 423 (L x W x H)
SIXTH FLOOR PLAN
PROJECT SCHOOL IMPROVEMENT PROGRAMME PHASE I, PACKAGE I, ALTERATION WORKS FOR FATHER CUCCHIARA MEMORIAL SCHOOL CHEUNG CHING
DRAWING TITLE (PROPOSED) GROUND FLOOR PLAN & 1 ST. FL. PLAN
DATE: 9-6-95
SCALE: 1 : 100


800 WIDE ACCESS PANEL UNDER STORE END 100 MM. TK. YTONG BLOCK WALL FILLED
PAINTED HOT DIP GALVANIZED STEEL SUPPORT MEMBERS ON PLINTHS
75x75 DRAIN-HOLES SHALL BE PROVIDED WITH CHROME-PLATED BRASS VERTICAL GRATINGS
NEW PRECAST CONC. BLOCK GRILLE & RAILING TO MATCH EX.
EXISTING GUTTER
1100MM. H. PARAPET WALL W G.M.S. SCREEN ON TOP
NEW WALL of 100 MM. TK. YTONG BLOCK AND PLK. TO MATCH EXISTING
COVERED AREA
100 MM. TK. YTONG BLOCK WALL AT F/L. TO STEP LEV. END OF ABOVE 100 MM. H.
WASHED GRANO. ON CEMENT SCREED
RUBBER STUBBED FLOORING
NEW STEEL STAIRCASE
PROTECTIVE G.M.S. GRILLES FOR EXISTING WINDOWS AT L/L.
CORRIDOR
EXTENSION STAIRCASE FROM 6/F
VITREOUS MOSAIC TILES FL.
CUPBOARD
TACK BOARD
INTERVIEW RM.
INTERVIEW RM.
WHITE BOARD
LOW SHELVES
LIBRARY
EXISTING GUTTER
AIR-CONDITIONED
7TH. FL. PLAN
(ALTERATION)

222


ADJOINING NEW ANNEX BLOCK
EX. GIRLS' LAVATORY
EX. METER ROOM 6m²
EX. KIOSK 16m²
EXISTING STAIRCASE
EX. COVERED PLAYGROUND 310m²
EX. STORE 8m²
EX. B.E. STORE 25m²
EX. BOYS' LAVATORY
NEW DISPLAY CABINET
NEW ELECT. METER ROOM
NEW RAMP UP 1 : 20
NEW 1800x1800 NO. 5 DRAW-PIT WITH REMOVABLE CONC. COVERS
NEW 1800x1800 NO. 4 DRAW-PIT WITH REMOVABLE CONC. COVERS
CABLE DUCTS
EX. SCREEN WALL, CANOPY AND DOORS TO BE DEMOLISHED
NEW H.R.
300x200 LOUVRE C/W F.D.
150x150mm GLASS BLOCK
AIR TOILET
FX1
NEW 1/2HR F.R.P. FIXED LIGHT
NEW LIFT LOBBY
NEW LIFT "1"
NEW 1800x1800 NO. 3 DRAW-PIT WITH REMOVABLE CONC. COVERS
150x150mm GLASS BLOCK 1/2 hr. F.R.P.
NEW BUILDING LINE ABOVE
EX. ADJOINING SCHOOL BASKETBALL COURT
NEW COVERED MULTI-PURPOSE AREA (110m²)(55P.)
BASKETBALL COURT (RE-PROVIDED)
EX. BASKETBALL COURT TO BE DEMOLISHED
VENTILATION SYSTEM PLEASE REFER TO CLP's REQUIREMENTS & DRAWINGS (DWG. NO. KT/TR/2002-51)
600x500 EXTERNAL LOUVRE BY BUILDING WORK (REST OF LOUVRE TO BE BLANKED OFF INCLUDED IN BUILDING WORK)
NEW 1800x1800 NO. 2 DRAW-PIT WITH REMOVABLE CONC. COVERS
NEW MAIN ELECT. SWITCH ROOM
NEW TRANSFORMER ROOM
1 NO. OF 1500KVA SILICONE OIL-FILLED TYPE TRANSFORMER
NEW F.S. TRANSFER PUMP ROOM
180° SWING STEEL DOOR W/ ML AT H/L & L/L
NEW 3600x1800 NO. 1 DRAW-PIT WITH REMOVABLE CONC. COVERS
500x500 EXTERNAL LOUVRE BY BUILDING WORK (REST OF LOUVRE TO BE BLANKED OFF INCLUDED IN BUILDING WORK)
NEW UP 25R STAIRCASE
Water Valve
RECONSTRUCTED 200mm U-CHANNEL CONNECTED TO EX. M.H.
EX. CHAIN LINK FENCE TO BE DISMANTLED & REPLACED BY R.C FENCE WALL
CATCH PIT
GROU



UND FLOOR PLAN

LEGEND

- 250x250mm RECTANGULAR DUCT UNLESS OTHERWISE SPECIFIED
- T — WIRED REMOTE CONTROLLER C/W ON/OFF SWITCH, THERMOSTAT, TEMPERATURE CONTROLLER, & FAN SPEED CONTROLLER (FOR SINGLE FCU)
- E — EMERGENCY STOP PUSH BUTTON
- V — REGULATOR FOR D.X. FAN COIL UNIT AT 1350mm AFFL
- F — 20A DP. MANUAL BY-PASS SW. C/W PILOT LAMP FOR FAP AT 1350mm AFFL
- REFRIGERANT PIPE & CONTROL CABLE
- DRAIN PIPE
- VENTILATION FAN FOR TYPE OF VENTILATION FAN, REFER SCHEDULE OF VENTILATION FANS
- DUCT FAN FOR TYPE OF VENTILATION FAN, REFER SCHEDULE OF VENTILATION FANS
- FCU — FAN COIL UNIT OF SPLIT AIR CONDITIONER(A/C INDOOR UNIT) (WALL MOUNTED TYPE)
- FCU — FAN COIL UNIT OF SPLIT AIR CONDITIONER(A/C INDOOR UNIT) (CEILING MOUNTED DUCT TYPE)
- FCU — FAN COIL UNIT OF SPLIT AIR CONDITIONER(A/C INDOOR UNIT) (4 WAYS CEILING CASSETTE TYPE)
- ODU — OUTDOOR UNIT OF THE SPLIT TYPE AIR CONDITIONER C/W SUPPORTING FRAME OR CONCRETE PLINTH BY BUILDING TEAM
- 600x600 S.A. DIFFUSER C/W VCD UNLESS OTHERWISE SPECIFIED (NECK SIZE 300x300mm FOR S.A. NOT EXCEED 200L/s) (NECK SIZE 375x375mm FOR S.A. NOT EXCEED 300L/s)
- 300x300 EXHAUST AIR GRILLE
- 600x300 EXHAUST AIR GRILLE
- 600x600 RETURN AIR GRILLE C/W WASHABLE FILTER
- 1200x450 RETURN AIR GRILLE C/W RETURN AIR PLENUM & FILTER
- VOLUME CONTROL DAMPER
- FD — FIRE DAMPER
- FCU XX — FAN COIL UNIT OF SPLIT TYPE AIR CONDITIONER FOR TYPE OF FAN COIL UNIT, REFER SCHEDULE OF SPLIT TYPE AIR CONDITIONERS
- ODU XX — OUTDOOR UNIT OF SPLIT TYPE AIR CONDITIONER FOR TYPE OF OUTDOOR UNIT, REFER SCHEDULE OF SPLIT TYPE AIR CONDITIONERS
- EXTERNAL LOUVRE INCLUDED IN BUILDING WORKS
- TM — THERMOSTAT
- CP — CONTROL PANEL C/W TIMER & THERMAL CONTROL IN THE LIFT MACHINE ROOM OR CONTROL PANEL C/W THERMAL CONTROL IN THE E/M PLANT ROOM
- WASHABLE FILTER
- △ — DOOR LOUVRE INCLUDED IN BUILDING WORKS NET FREE AREA 0.1 SQUARE METRE
- ▲ — DOOR LOUVRE INCLUDED IN BUILDING WORKS NET FREE AREA 0.2 SQUARE METRE
- DONATES FUTURE MVAC PROVISION BY OTHERS

Rankine & Hill (Hong Kong) Limited

THE CONTENTS OF THIS AS-FITTED DRAWING/MANUAL/T&C REPORT HAVE BEEN CHECKED AND FOUND IN ORDER AND ACCEPTABLE.

Signed : _____
Name : Y.K. CHAN
Date : 13/5/2004

AS-FITTED

NOTES

1. FOR GENERAL NOTES, LEGENDS AND ABBREVIATIONS, EQUIPMENT SCHEDULE PLEASE REFER TO DRAWING NO. BS/6490/P404/AC001.
2. THE CONTRACTOR SHALL CARRY OUT THE NOISE MEASUREMENT ON SITE FOR ALL SCHOOLS TO ASCERTAIN THE DESIGN OF NOISE ABATEMENT MEASUREMENTS CORRESPONDING TO THE GUIDELINES FROM ENVIRONMENTAL PROTECTION DEPARTMENT. THE NOISE MEASUREMENT SHALL BE IMMEDIATELY CARRIED OUT AFTER THE SUPERSTRUCTURE OF THE NEW ANNEX AND ROOF TOP EXTENSION ON THE EXISTING SCHOOL BUILDING HAS BEEN COMPLETED OR BEFORE THE COMMENCEMENT OF ROOM CONVERSION WORKS (FOR SCHOOL WITHOUT NEW CONSTRUCTION).
THE NOISE MEASUREMENT SHALL COVER THE ROOMS AS LIST BELOW:
i) CLASSROOM, ii) REMEDIAL TEACHING ROOM, iii) SUPPORTIVE EDUCATION ROOM, iv) MULTI-PURPOSE ROOM, v) GENERAL STUDIES ROOM, vi) MUSIC ROOM, vii) ART & CRAFT ROOM
3. ALL MVAC EQUIPMENT (INCLUDING A/C INDOOR UNITS AND OUTDOOR UNITS, REFRIGERANT PIPES, CONTROL CABLES, FRESH AIR PRE-CONDITIONERS, AIR DUCTS, AIR GRILLES, INSULATION, FILTERS, DRAIN PIPES, WIRED REMOTE CONTROLLERS AND ASSOCIATED INSTALLATION) IN THE ROOMS SHALL BE SUPPLIED AND INSTALLED ONLY WHEN THE NOISE MEASUREMENT RESULTS OF THE ROOMS EXCEEDS THE NOISE LEVEL STANDARD OF ENVIRONMENTAL PROTECTION DEPARTMENT.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISMANTLING ALL UNUSED MVAC EQUIPMENT/INSTALLATION AS INDICATED ON THIS SET OF DRAWINGS AND THE ASSOCIATED INSTALLATION INCLUDING A/C UNITS, VENTILATION FANS, CABLES AND ETC. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR MAKING GOOD OF THE ENVIRONMENT AFTER REMOVAL OF THE EQUIPMENT/INSTALLATION INCLUDING SEALING OF WALL OPENING, REPLACEMENT OF WINDOW AFTER REMOVAL OF VENTILATION FANS AND ETC. THE CONTRACTOR SHALL RETURN THE SAID EQUIPMENT/INSTALLATION TO SCHOOL IF EQUIPMENT/INSTALLATION IS OWNED BY SCHOOL OR DESIGNATED OFF SITE GOVERNMENT WAREHOUSE IF THE EQUIPMENT IS OWNED BY EDUCATION DEPARTMENT.
5. IN CASE OF NOT AIR-CONDITIONING PROVIDED, A/C PLATFORMS, LOUVERS, PIPE SLEEVES AND OPENINGS INCLUDED IN BUILDING WORKS SHALL BE PROVIDED FOR THE INSTALLATION OF A/C UNITS AND F.A.P. IN FUTURE. SEALANT SHALL BE FILLED INSIDE PIPE SLEEVE FOR FUTURE A/C UNITS.
6. FOR MVAC INSTALLATION DETAILS, PLEASE REFER TO DRAWING NO. BS/6490/P404/AC010.

LEGEND

- SURFACE ADAPTABLE BOX
- 4 — 100 x 100 mm CONCEALED ADAPTABLE BOX
- 6 — 150 x 150 mm CONCEALED ADAPTABLE BOX
- 9 — 225 x 225 mm CONCEALED ADAPTABLE BOX
- SC — SURFACE G.I. CONDUIT ø20mm
- SC — SURFACE G.I. CONDUIT ø25mm
- CONCEALED PVC CONDUIT ø20mm
- CONCEALED PVC CONDUIT ø25mm
- CONCEALED PVC CONDUIT ø32mm

REVISION	DESCRIPTION	REVIEW & APPROVAL FOR SUBMISSION BY	DATE
B	AS PER ARCH. COMMENT	ALPK	3/11/03
A	AS PER ARCH. COMMENT	ALPK	20/9/03

PROJECT:
SCHOOL IMPROVEMENT PROGRAMME
FINAL PHASE PACKAGE 7 (GROUP 1)

Contract No.
AL L310

Project Architect:
Chung Wah Nan Architects Ltd.

Project Building Services Engineer:
RANKINE & HILL (HONG KONG) LIMITED
Room 2001, Sing Pao Building, 101 King's Road, North Point, Hong Kong.

ARCHITECTURAL SERVICES DEPARTMENT

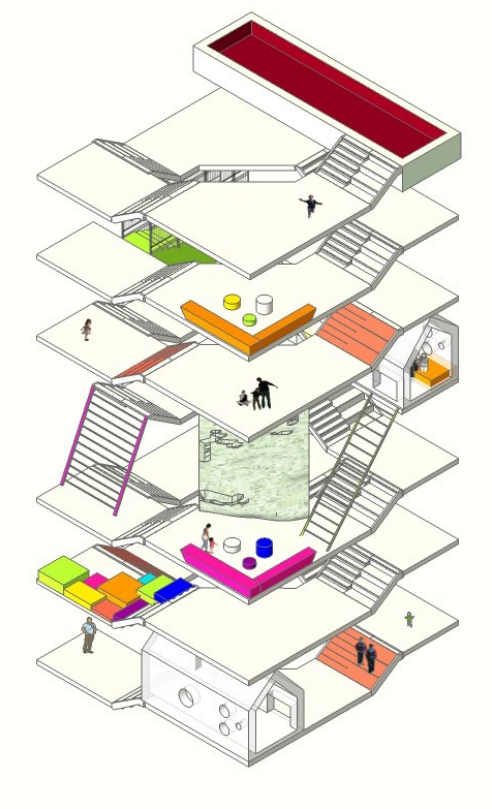
CONTRACTOR:
FONG WING SHING CONSTRUCTION CO. LTD.

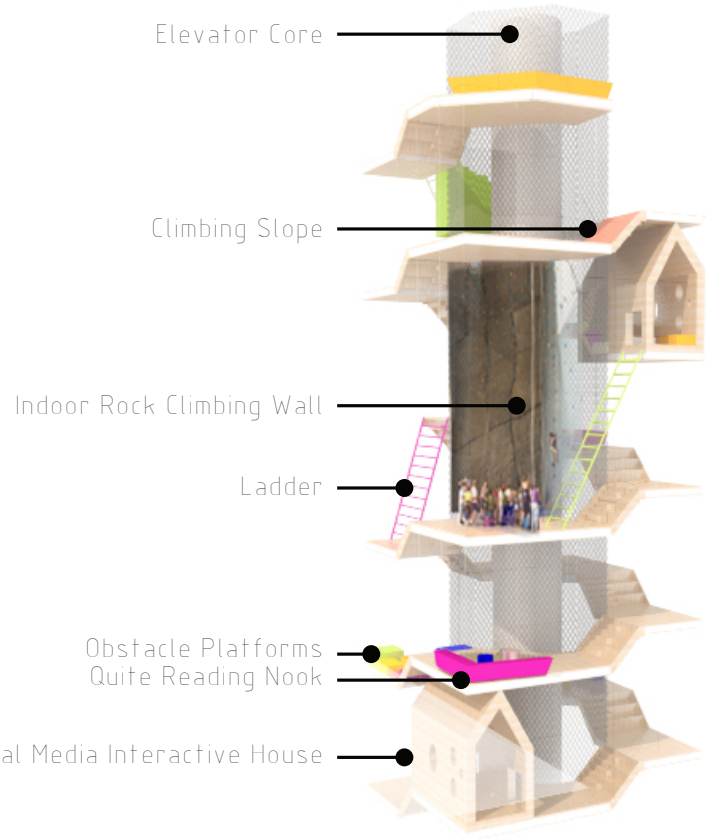
RYODEN ENGINEERING CO., LTD.
11/F Ryoden Industrial Centre, 26-38 To Chuen Ping Street, Kwai Chung, N.T.

TITLE: MAN KIU ASSOCIATION PRIMARY SCHOOL (P404)
MVAC LAYOUT C/W CONDUIT RUN FOR G/F

SCALE	1 : 100	DATE	JAN 2003
DRAWN BY	EWLC	JOB No.	2323-3106
DESIGNED BY	ALPK	DWG No.	2323-3106/P404/AC/101
CHECKED BY	ALPK		
REVIEW & APPROVAL FOR SUBMISSION BY	ALPK		

Exploratorium Design





EXPLORATORIUM. Creating an Informal Learning Culture - endless ways to learn, explore, interact, communicate, play, discover, invent and, reinvent. A conceptual diagram of a vertically organized learning environment for children and family.

A combination of a school, a playground and a museum.